

THE

BRITISH INDIAN

MILITARY REPOSITORY
Military Repository.

VOL. I.

N. 334

BY

CAPTAIN SAMUEL PARLBY,

BENGAL ARTILLERY, MODEL MASTER,
DUM-DUM.

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13

DEDICATION.

TO THE
OFFICERS
OF THE
BRITISH INDIAN ARMY,

THE
Military Repository

IS INSCRIBED,

WITH THE HOPE OF AFFORDING A READY MEANS OF RECORDING THEIR

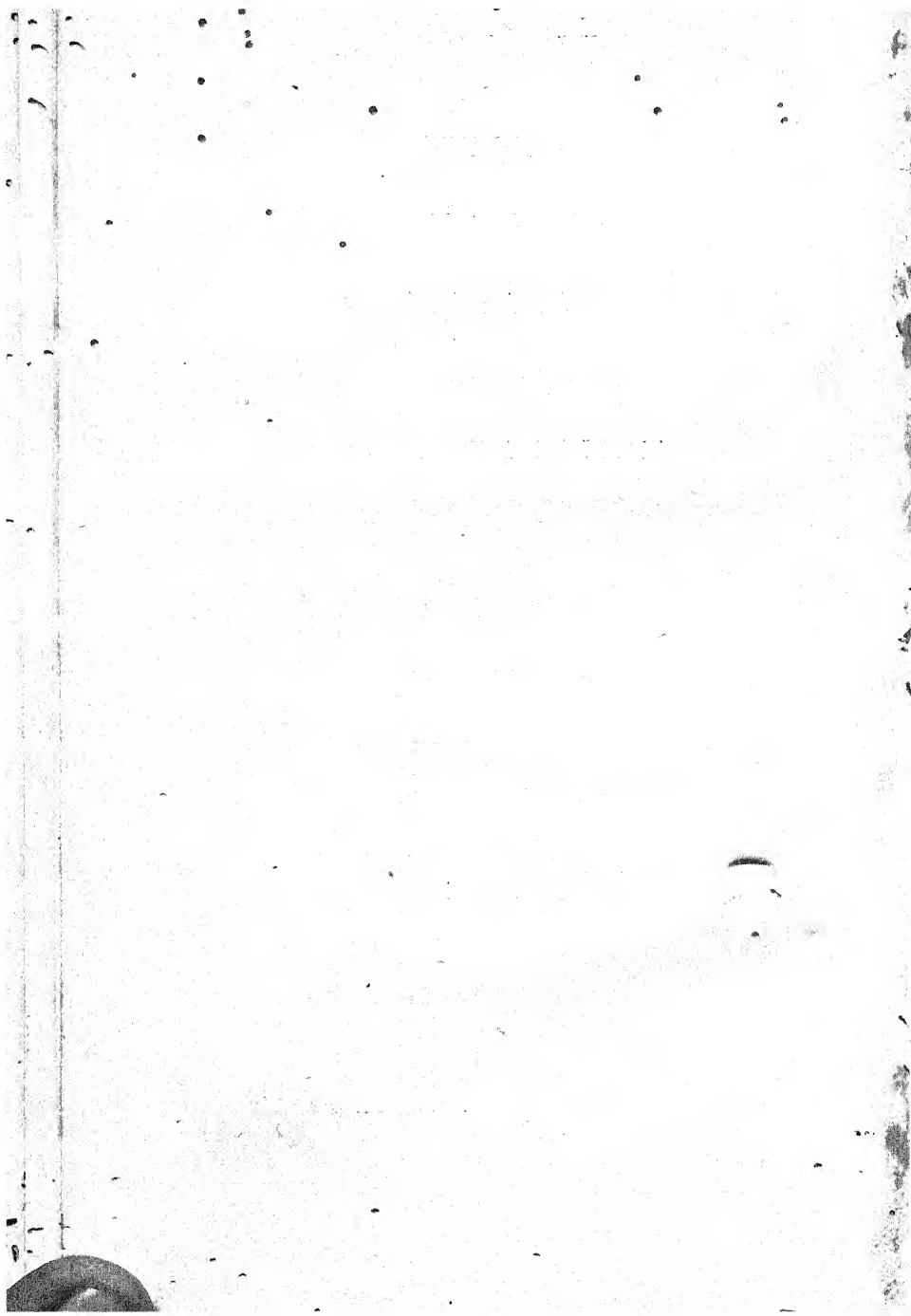
ACHIEVEMENTS IN THE FIELD

AND PROMOTING

PROFESSIONAL SCIENCE,

By their humble Servant
and sincere well-wisher,
A BROTHER OFFICER.

Calcutta,
1st July, 1822.



PREFACE.

IN the prospectus which the Editor of the British Indian Military Repository had the honor to submit to the Officers of the Indian Army, the desire to supply an important desideratum was set forth as the principle on which he acted.

The undertaking has been kindly encouraged by Major General Hardwicke, Commandant of the Bengal Artillery, in circulating many copies of the prospectus; and the Editor feels the highest pride in placing the names of so many of his Brother Soldiers in the first number of the British Indian Military Repository.

In expressing the hope that the Readers of the pages now submitted to them may not be altogether disappointed, the Editor expects that future Numbers of the work may be rendered more valuable by original communications from some of the many highly distinguished characters, who are justly esteemed and honored in the Armies of the three Presidencies; and such communications he most earnestly solicits.

The Articles in the present Number may, perhaps, be considered as too exclusively devoted to the Artillery. The Editor's apology must be, that he has been obliged chiefly to provide them from the resources in his power; but he pledges himself that no communication from any department of the Army, if it comes within the intention and limits of this publication, shall ever be passed by, and that additional pages shall be added to any future Number sooner than omit any valuable paper which may be forwarded to him.

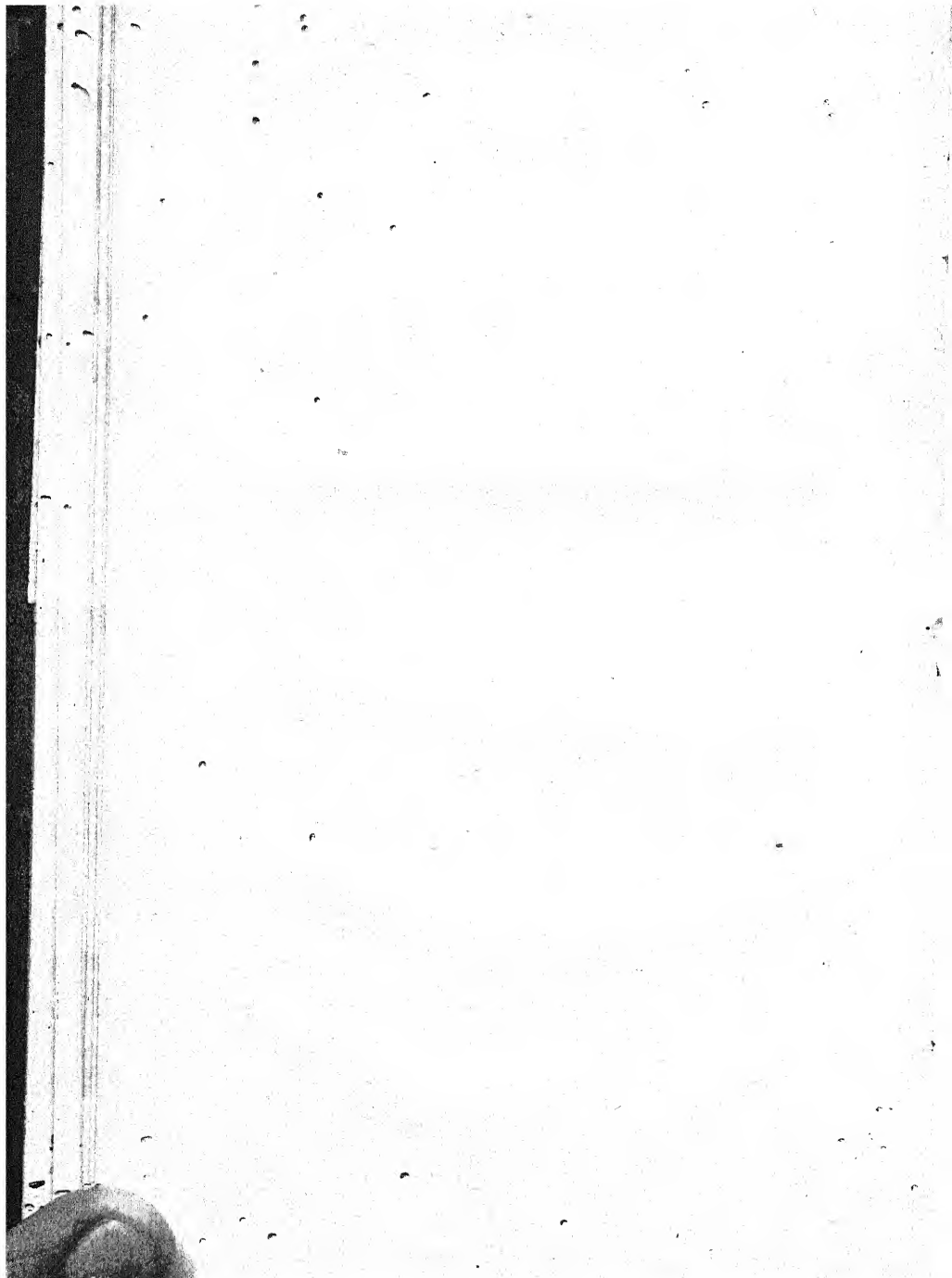
As the Editor is sensible that he can gain no credit as an author, the superior gratification of being an useful compiler, is what his mind rests upon; and if he is satisfied of this, his future labors will be amply rewarded; and he trusts the pages of the British Indian Military Repository may be resorted to, as a ready and lasting means of recording the honorable achievements of the British Indian Army.

The work is intended also to embrace discussion of all military topics—to encourage literary communications between the Armies of the different Presidencies—to record biographical notices of celebrated military characters, and the results of their experience—to promote Professional Science in all its branches—and to notice all new military works, especially those relating to India.

In laying the first Number of the Military Repository before his brethen in arms, the Editor considers any apology uncalled for; the intent of the work, he feels he may say with a soldier's freedom, they will applaud; and the spirit of its future pages will, he trusts, be so well maintained, that excuses for want of interest in them will never be required.

January 1st, 1822.

*** It is requested that all communications for the work may be forwarded to Captain Parlby, Bengal Artillery, Dum Dum.



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THE
BRITISH INDIAN
Military Repository.

No. I.

JANUARY.

1822.

ARTICLE I.

Memoir of Colonel Thomas Deane Pearse of the Bengal A.D. 1768.

Artillery: containing numerous, and interesting extracts from his original correspondence, connected with some of the most important events in the Government of India.

COLONEL Thomas Pearse claimed his descent from ColPearse's family. a very respectable family; his father resided at Reading, in Berkshire, and enjoyed a handsome independence, which, shortly after the birth of his son, was by misfortune irrecoverably lost. The dawning prospects of young Pearse, the subject of the present Memoir, were thus early blighted, and the Army was chosen as the only resource left to provide for him in a manner suitable to his birth.

These circumstances he mentions feelingly in a letter to an old school-fellow, Mr. Skinner, dated from Allahabad, March 29th, 1776.—

“Since you and I were happy together in our boyish days, I have experienced some changes: my father was ruined by the breaking of a Mr. Bellamy, and a long and expensive lawsuit, in 1757. They took me from school to carry me to the parade at Woolwich.”

A. D. 1768.
Admitted
a cadet at
Woolwich.

Young Pearse was in his 15th year when admitted as a cadet into the Royal Academy at Woolwich; and he went through his course of study in a manner peculiarly honorable to himself, in every instance exhibiting that firmness of mind and decision of character, which distinguished him through life.

On the 8th of June, in the year 1757, young Pearse obtained a Lieut. Fireworker's Commission in the Royal Artillery, and was present on service with detachments of his corps, both on the Continent and in the West Indies, on many memorable occasions, as detailed in the following extract from a letter to Lionel Darell, Esq.

His early
services.

"I served through all the war before the last, beginning with St. Malos, Cherburgh and St. Coss in 1758; Martinico and Guadaloupe in 59; Bellisle in 61; and Havannah in 62; and though I was not at the head, I was in the heat of every attack."

Lieut. Pearse, from his marked merit and abilities, found several warm friends amongst the celebrated and distinguished officers at that time at the head of his corps, particularly General Desaguliers, and General Pattison, with whom he kept up a constant correspondence.

History of
his coming
to India,
and ap-
pointment
of Major.

The history of Colonel Pearse's coming to India is given in the following letter to Brig. General Sir Robert Barker, Commander in Chief in India, dated the 13th of February 1773:—

"In the year 1768, the Court of Directors, having determined to augment their troops on the Bengal Establishment, were desirous of having officers from the King's Artillery to promote into their service; and also cadets to be appointed Lieut. Fireworkers."

“Application was accordingly made through Mr. A. D. 1768. Scrafton to Lieut. Col. James Pattison, Lieut. Governor of the Royal Military Academy of Woolwich, not only for cadets, but even to recommend officers; in consequence of which I had the honor of being nominated to be Lieut. Col. Commandant of Artillery. I remained in expectation of my appointment for some weeks, and should have come to India with that rank, had not the Honorable Court of Directors thought proper to bestow it on Captain Martin, in lieu of the post of Chief Engineer in Bengal, which that officer did then enjoy.* I was therefore appointed Major of Artillery, and given to understand by the Chairman, that on the resignation of Lieut. Col. Martin, or his death, or removal, I was to be appointed to the command in his stead.”

The following commission was given to Col. Pearse on his sailing for India :—

“The United Company of Merchants of England trading to the East Indies, to Thomas Deane Pearse, Esq. Greeting.”

“We the said United Company, reposing a special trust and confidence in you, constitute and appoint you to be Major of Artillery in our service, at our Presidency of Fort William in Bengal, in the East Indies, and do give and grant you full power and authority to take

* At that time a Captain Campbell, an officer of the Royal Engineers, applied to come out as Chief Engineer to Bengal, and having superior interest to Captain Martin, he obtained the appointment, and the Directors recompensed Captain Martin for his removal by appointing him Lieut. Col. Commandant of Artillery.

A. D. 1768. your rank and post as Major of Artillery accordingly, from the day of your arrival at our said Presidency. You are, therefore, to take upon you the said charge and command of Major of Artillery, and faithfully, diligently, and carefully to discharge the duty thereof, by executing all and all manner of things thereunto belonging; and we do &c. &c."

This Commission was signed the 29th day of February 1768, under the common seal of the East India Company, and countersigned by P. Mickel, Secretary.

Arrives in
Calcutta in
August.

Major Pearse sailed from England in March 1768, and arrived at Calcutta on the 26th of August, of the same year. On his arrival, he found that the Board had appointed a Captain Nathaniel Kindersley, Major in the Artillery; and by back-dating the latter's commission, so as to make it senior to Colonel Pearse's, the command of the Artillery devolved upon Major Kindersley, as Lieut. Col. Martin resigned on the 8th November following.

This disappointment, and what he conceived breach of promise on the part of the Directors, Major Pearse at first very severely felt; but he reconciled himself with the hope that, on a fair representation of the case, justice would be done towards him. The supersession was peculiarly unjust to Major Pearse; for Captain Kindersley (as it appears by a memorial to the Honorable Court of Directors) was a junior officer in His Majesty's service; and as Major Pearse was aware that Captain Kindersley had sailed for India, he refused to proceed without the seniority of his rank to Captain Kindersley being acknowledged at the India House, and obtained the promise that he should not be superseded by him in India.

The following answer from the Secretary to the Council was received by Colonel Pearse to an appeal made by him to the Honorable Harry Verelst, Esq., President and Governor &c. of the Council of Fort William, dated Allahabad, 27th December 1768:—

To Major Thomas Deane Pearse.

“SIR,

“I have it in command from the Honorable the President and Council to acknowledge the receipt of your letter to them of the 28th day of December, soliciting the rank of Lieut. Col. of Artillery, and to acquaint you in answer, that they are sensible of the hardness of your case, and the just plea you had for your remonstrance; but as they had appointed Major Kindersley to the rank he now holds, previous to your arrival, and before they were acquainted with your views and expectations, they cannot but think it would be a piece of injustice to that gentleman, and an impropriety in their own conduct, to set aside the commission they have granted him, and give the rank to you. A representation to the Court of Directors of your situation has been made. The application you have made to the Honorable President and Council to be appointed to the Infantry, it is beyond their power to grant you, which I am directed to inform you of.”

Answer to
appeal
about rank.

“Fort William,
23rd Feb. 1769.”

“I am,
Sir,

Your most obedient Servant,

(Signed) EDWARD BARBER, Secretary.”

Both Mr. Verelst and Mr. Cartier wrote in a private way to Major Pearse to soften his disappointment. Mr. Cartier's letter was as follows:—

A. D. 1768.
Letter from
Mr. Cartier.

To Major Pearse.

"SIR,

"I have received your favor of the 19th March. Though the short acquaintance I had the opportunity of cultivating gave me the most favorable impression of your merit, I will not presume to rest my judgment on what a few accidental hours afforded me. I must have recourse, Sir, to your general character in life; from that I am informed that you are not only eminent in the particular duties of your profession, but valuable in the different calls of private friendship. In these different views consider yourself to be thought of by every Gentleman forming the present administration: I am certain it is so, and you may rely on my assurances."

"In your late application to the Board, no one was there, I am certain, but considered it and the state of facts with the utmost candour—no one but thought you had reason to complain, in having the hopes you had been led to entertain so greatly disappointed. It was in general thought by the Honorable President and Council that it would be doing injustice to Major Kindersley if they were to grant you the rank above him, who, though a younger officer in his Majesty's service, had served the Company with steadiness and merit some years before you came to this country. This, Sir, gave the Gentleman a superior title in our late promotions; being confident the Company never intend to be guilty of intentional injury to individuals, either in the Civil or Military departments; and when accidentally they do commit it, a right we conceive they leave with their Government here to redress it. However, the affair is very impartially transmitted home, and whatever resolution the Court of Directors may convey to us on this

head, I hope will be submitted to with pleasure by the interested parties. We considered this contest with all possible impartiality, and be assured no personal predilection inclined us to either side."

"Calcutta,
31st March, 1769."

"I am with esteem,
Sir,

Your most obedient servant,
(Signed) JOHN CARTIER."

Several representations and very able memorials passed on the above occasion; but the grievance was soon removed by Major Kindersley's death, which event took place on the 24th October 1769, and Major Pearse was then promoted to the rank of Lieut. Colonel, and placed in command of the Bengal Artillery.

This distinguished officer held the command of the Bengal Artillery for 21 years; he was an intimate friend of Mr. Hastings, and was honored with the confidence of Lord Cornwallis; and as his service in India took place during the Government of these illustrious statesmen, the numerous extracts from his original letters now published, will be found to possess extreme interest and entertainment; forming in themselves a concise history of the times, and throwing new lights upon many important scenes connected with the British Government of India.

Colonel Pearse may be considered as the first professionally educated Artillery officer who entered into the Honorable Company's service; and we may well say, without detracting from the merits of his successors, that few, if any, have been his equals in professional science, and in that laudable and never to be too highly prized ardour, with which he devoted himself to the important duties of his command.

A.D. 1768.
State of the
corps on
ColPearse's
coming to
the com-
mand.

The state of the corps, and its equipment, when Colonel Pearse came into the command, may be judged of, from the following extracts from letters to General Desaguliers, and Mr. Muller, 1775.—

“When I first came into the command of the corps, I was astonished at the ignorance of all who composed it. It was a common practice to make any Midshipman, who was discontented with the India ships, an officer of Artillery, from a strange idea, that a knowledge of navigation would perfect an officer of that corps in the knowledge of Artillery. They were almost all of this class; and their ideas consonant to the elegant Military education which they had received. But, thank God, I have got rid of all of them but seven.”

“I have compelled all officers to perform laboratory work at the annual practice.”

And to General Desaguliers, in 1772, he writes—

“When I was at practice in 1770, the fuzes burnt from 19 to 48 seconds, though of the same nature. The portfires were continually going out. The tubes would not burn. The powder was infamous. The cartridges were made conical, and if it was necessary to prime with loose powder, a great quantity was required to fill the vacant cavity round the cartridge. The carriages flew into pieces with common firing in a week.”

“All this I represented, but my representation was quashed; the contractor still makes the carriages, the laboratory is in the same hands, and I have no more to do with it, than his Holiness at Rome.”

“Now I have got all the laboratory implements with me at practice, and I am going to teach the officers what they never saw.”

Innumerable quotations from Colonel Pearse's letters A. D. 1769, might be given as arguments of the constant attention which he gave to the duties of his profession, and of the exertions which he made to advance the character and improve the abilities of the corps; suffice it to say, that during the whole period of his service these exertions were unremitting, and the success of them will be borne witness to in the succeeding pages of this Memoir.

As several interesting and entertaining letters appear amongst Colonel Pearse's MSS. dated in the beginning of 1769, before Colonel Pearse obtained the command of the corps, we shall retrograde a little in order to indulge the reader's curiosity.

Colonel Pearse, soon after his arrival, was ordered up to Allahabad, which, with Chunar, had been taken from the Mahrattas, by the Army under Major Stibbert in 1765; here he remained until July 1769.

At this period of Colonel Pearse's service, the Madras Army was in the field under a very able officer, a Colonel Smith, against the combined Armies of Hyder Alli and the Nizam. In December 1768 an action was fought, in which the English commander defeated the enemy. The Nizam, after this defeat, separated his troops from Hyder Alli's, and concluded a peace, and a defensive alliance with the English.

The Madras Government, presuming upon the late success, and the defection of the Nizam, indulged the idea of making a conquest of Mysore, and under an idea of bringing the operations of the Army immediately under their controul, the Council took the ill-judged determination of sending two of their members under the title of *Field Deputies* to join the Army, and Colonel Smith was directed not to undertake any operation

A.D. 1769. without their concurrence ; in fact, they were to direct all operations.

Disgust in the mind of the successful soldier was the natural consequence of such a proceeding ; the operations of the Army were without energy or effect ; and disaffection on the part of the Army, and dissatisfaction on the part of Government followed. Colonel Smith either resigned his command from disgust, or was recalled by the Madras Council ; and the consequences were that the Army met with a series of disasters after his departure.

A letter from Colonel Pearse at this time, to an old Woolwich friend, throws some light upon the circumstances and the state of affairs in Bengal.

Allahabad, Feb. 23rd, 1769.

“ Our affairs on the coast seem to be in a disagreeable situation. Hyder Alli understands the art of war rather too well for them. Whilst Smith was with the Army, he drove the enemy before him ; but he was plagued with Field Deputies, and had received positive orders to march into the enemy's country, which abounds in woods and morasses. He foresaw the difficulties of the enterprize, and rather than risk every thing, he resigned his commission and went to Madras, where the Field Deputies soon followed, to answer for their conduct. The command was given to Colonel Wood, who, obeying the orders of the Deputies, marched into the country. The enemy drove off all the cattle and provisions, and retreated every where before him ; he pursued, when famine began to make it necessary to think of returning ; this was what Hyder wanted ; he now pursued in his turn, continually beating and harassing the detachments of the Army, till at length he took away all their ammu-

nition, and I believe Artillery, though it is not asserted, A.D. 1769.
 as every thing is kept as secret as possible. The com-
 mand was then given to Lang, whose rank I do not
 know. A detachment in a wood, being attacked, were
 defeated; 140 Europeans, 6 pieces of cannon, and 1500
 sepoys, were taken prisoners. The Governor and Coun-
 cil, seeing that affairs began to assume a very unpleasant
 appearance, desired Colonel Smith to return to the com-
 mand. He at first refused, nor would he go till he was
 sent without Field Deputies, and with full powers. Hyder
 Alli has also taken a Fort ~~W-A~~, with 250 Europeans, *Brode*
 10 pieces of cannon, ammunition, &c. for 6 months, and
 1500 sepoys. It was done in the following manner:
 Hyder summoned Captain ~~Norton~~, commanding the Fort *of*
 to surrender, and on the back of the summons he sent
 an invitation to the Captain to come and visit him at
 his tent. Captain ~~Norton~~, being a very polite man, went, *of*
 was seized, and with a drawn sword over his head he was
 desired to write to the next officer in the post to surren-
 der, which he was dastard enough to do; and the other,
 like a very great fool, obeyed. The Roman Centurions
 would have set a better example. Assistance has been
 asked from Bengal, in men, ammunition, and money;
 and it is said the remainder of the first Brigade will
 go."

"The situation of our affairs here does not seem to be Situation of
 affairs in
 Bengal.
 much better, although at peace. The French had ship-
 ped off a great deal of money; an order was issued
 forbidding that any should be sent off from the country.
 The Nabob of Bengal, or Patna, I do not know which,
 though I believe the former, ordered his peons to sur-
 round Chandernagore till it should be re-landed. The
 French fired on them from the ship, by which many

A. D. 1769. were killed and wounded; the consequence was the destruction of the town. The Nabob's people pulled down the houses and laid every thing in ruins. Monsieur Chevalier wrote to the Governor of Fort William, desiring that the neutrality which subsisted between the two nations might continue, (for that he was determined to march against the Nabob,) and that the ship might not be molested. He was answered, that if she attempted to pass, she would be fired into by the guns of the Fort. The Nabob having demanded our assistance, the ship was afterwards seized; but I hear since she is gone. The Nabob has ordered all the French down; trade is entirely stopped, which may perhaps end in trouble. The King left us lately; he took with him all his people, and said that he was going to Phaizabad on a visit; but the true reason of his departure must be discovered in time."

"Money is so scarce that we have none to lend to Madras. Our sepoys have only just got their pay for December; in short, they begin to desert. If troops go to the coast, I am resolved to go with them if I can, that I may assist at the siege of Madras (which is expected,) or be present at its relief."

Curious
summary of
news.

The summary of news and events long since passed by, as given in the following extract from a letter to Lieut. Mayaffre, an old Woolwich friend, then in the corps, is entertaining—

"The news just received is, that the King of Prussia and the Russians have joined to attack the Grand Seignior, who has marched to Adrianople with 60,000 men. Princess Louisa Ann, George's sister, is dead; the Queen of France the same. Wilks is sentenced to pay 500£ fine for re-publishing No. 45, and to suffer

10 months imprisonment. He is fined 1000£ and is A.D. 1769. sentenced to 12 months imprisonment for publishing an Essay on Woman; he has appealed to the Parliament for redress. Lord Bute is dying. Wilks gives 2000£ security for good behaviour for 7 years. No. 45 is considered as the standard of rebellion, and the printers, sellers, &c. to be tried next sessions. Wilks, the East India Company, and a famine, seem to be equally talked of, and equally dreaded in England. Rigby is appointed Paymaster General, and Lord somebody has got his appointment in Ireland. The King of Denmark was expected in England; Lord Boston was to conduct him. Corsica is ceded to France; and the King of France adds, *King of Corsica* to his other titles. There is an elegant bridge thrown across the Ganges for the King, who is returned from his visit to Phaizabad."

If the manners of the times are not altogether improved, the following piece of satire may be useful. Colonel Pearse concludes his letter thus—

"D—— has been interrupting me by talking nonsense, such as the boobies* who now come out employ their time in; *live and be merry* is their theme, on which they write, talk, and follow it as closely as they can. To be a gentleman, you must learn to drink by all means: a man is honest in proportion to the number of bottles he can drink; keep a dozen dogs, but in particular if you have not the least use for them, and hate shooting and hunting. Four horses may barely serve; but if you have 8, and 7 of them are too vicious for the syce to feed them, it will be much better."

* This word might easily be modernized by changing four letters.

A.D. 1769. "By all means do not let the horses be paid for; and have a Palanquin, covered with silver trappings;* get 10,000 rupees in debt, but 20 would make you an honest man: especially if you are convinced that you will never have the power to pay. Endeavour to forget whatever you have learnt—ridicule learning of all sorts—despise all military knowledge—call duty a bore—encourage your men to laugh at orders—obey such as you like—make a joke of your commanding officer for giving those commands you do not like, and if you obey them, let it be so as to convince all your men that it is merely to serve yourself. These few rules will make you a gentleman and an officer, and it is the first lesson which young men take when they arrive in this country; and as I am your sincere friend, I sincerely recommend it to your careful attention."

In July 1769 Colonel Pearse (then Major) was ordered to proceed by water to the Presidency, in command of two Brigades of Artillery. The boats, both for passengers and baggage, appear to have been as bad as they now are. The detachment met with many severe losses: several budgerows and baggage boats being lost in bad weather.

The 1st August the detachment reached Berhampore and was ordered to halt, the services of the detachment not being required. Major Kindersley was at this time promoted to the rank of Lieut. Colonel, notwithstanding a representation of the supersession was then before the Court of Directors for their final decision. Major Pearse of course considered Major Kindersley's promo-

* Colonel Pearse mentions 1500 rupees as no uncommon price for a Palanquin in his time!!!

tion, a still further grievance to him; and he writes to A. D. 1769. Brigadier General Smith, commanding the Bengal Army, to forward his views by getting him transferred to the Infantry: having given up all hopes of promotion in the Artillery:—

“The occurrences of the last month have informed me that Major Kindersley was appointed Lieut. Colonel on the 20th, and is to rank from the 8th November 1768. This, Sir, is the cause of my uneasiness; not because that gentleman has got that rank, but because that rank to which I aspired is not vacant and not to be disposed of, but is filled up, and as far as man can judge, likely to continue so for many years, and because I am thereby cut off from any chance of obtaining the next rank, and consequently must expect to be superseded by officers, at present below me.”

Applies to
be removed
to the In-
fantry.

“The Infantry points out a very different prospect; assures those who are happy enough to be in it, that they will arrive at rank, by which they may be sure to secure a competency, or at least something sufficient to make their latter days not burthensome to themselves or their friends; and though the chief command of the Artillery may promise as fair a chance of obtaining a competency, yet I can truly assert that I know it not; and that command is less an object of my wishes than a removal from the corps; and happy should I think myself could I obtain a removal from the Artillery to the Infantry, with the rank I have.”

The orders of the Court of Directors were, however, positive that no removals from the Artillery to the Infantry should take place. Fortunately for Colonel Pearse he was not long kept out of that command which

A.D. 1770. he certainly was so justly entitled to, and for which he was so well qualified.

On the 28th day of October 1769, a letter from General Smith to Colonel Pearse communicated the intelligence of the death of Major Kindersley, on the 24th of the month; and General Smith adds, "The Governor and Council have taken your case into consideration, and I have the pleasure to congratulate you on being this day promoted to the rank of Lieut. Colonel and Commandant of Artillery, till the pleasure of the Honorable Court of Directors is known."

Attends Sir
Robert Barker to the
field.

In the latter part of 1770, Colonel Pearse was called upon to attend Sir Robert Barker, Commander in Chief, on his tour of inspection to the Upper Provinces; he has the Commandant of Artillery accompanying him, for the purpose of proceeding to the different ordnance stations in the field, and to survey the Artillery and stores. After having completed this arduous duty, Col. Pearse began his return to Fort William, and visited Benares with Sir Robert Barker, in March 1771. There he had an opportunity of examining the Observatory, of which he gives the following interesting description in a letter to General Desaguliers:—

Description
of the Ob-
servatory at
Benares.

"The principal curiosity here is the Observatory, built by Mawnsing, the son of Jysing, about 200 years ago; there is an exceedingly good mural arch cut upon a fine plaister of chuman, so fine and smooth, that it has the appearance of marble; and though it certainly is very old, it still is perfect, but the index is wanting; that is a loss which could very easily be supplied by a person who has a taste for these studies; for the centres are left in the wall."

“There are two ring dials; the large one is curious: A. D. 1770. the radius of the stone arch is 9 feet 8 inches; the gnomon is 4 feet 6 inches thick, and its slant side about 40 feet long; there are steps in the gnomon by which you ascend to the top of it. By the measure of the two gnomons, I find they stand in latitude $25^{\circ} 20' N$. There are likewise two small inclined dials, in which the gnomon is perpendicular to the plane of the stone on which the degrees are marked. Lastly, there is an instrument which I do not understand; the following is a description of it:—(See plate.)

“*a*, *b*, are circular walls; *a* is 24 inches thick, and near 16 feet radius; *b* is concentric with *a*, 18 inches thick, and between 12 and 13 feet radius. *c* is a cylinder of stone, its centre is the centre of the walls. *b* and *c* are of equal height, viz. 4 feet 2 inches; the outward wall is 8 feet 4 inches. The tops of these walls are horizontal, and are very nicely divided into degrees, and sub-divided into arches of $6'$. At the cardinal points on the top of the wall *a*, there are iron pins, from which I conjecture there has been an instrument to fix upon the wall, though I do not know for what purpose or of what kind.”

“Lastly the second, for I had forgotten an instrument for taking the declension of the sun, &c. which consists of a circle of iron, covered with brass, an axis of the same materials, and an index with sights. This axis, which is a diameter of the circle, and consequently in the plane of it, moves on pivots fixed in the walls which support it, and is parallel to the axis of the earth. The divisions are very much inferior to those on the stone.”

Colonel Pearse, instead of returning to the Presidency, was, however, called upon by Sir Robert Barker, to pro-

Detained in
the field on
account of a
Court Mar-
tial.

A. D. 1772. ceed to join a detachment of the Army in camp, under the command of Lieut. Colonel Grant, in order to be president of a Court Martial on a Lieut. Osborne. Colonel Pearse accordingly proceeded to the camp, and the detachment marched to Mongheer, where the Court Martial commenced its proceedings in May 1771, on various charges for crimes committed by Lieut. Osborne during a temporary suspension from service. The proceedings were protracted to an unusual length by Lieut. Osborne's disputing the power of the Court to try him; because, when he committed the actions for which the charges were sent against him, he considered himself as being under suspension, and not under Military authority; and when his protest was unanimously invalidated by the Court, he objected to not less than ten of the Members of the Court, eight of whom he called upon as witnesses. After various delays and difficulties, in which the conduct of Colonel Pearse, and his knowledge of Military law, shewed how fitly he had been selected to be president of the Court Martial, the proceedings, which had taken up four months, were closed about the end of September 1771, and in the early part of December following, Colonel Pearse proceeded to Fort William.

In a letter to General Pattison, 23d March 1772, Colonel Pearse gives an interesting sketch of the state of affairs at this important crisis, and of the approaching entrance of Mr. Hastings into his Government—

King of Delhi throws himself into the hands of the Mahrattas.

“The King of Delhi has thrown himself into the hands of the Mahrattas; he, of himself, is of but little consequence, because he is not remarkably clever, nor active; but his name gives a sanction to the incursions of the Mahrattas, and they and our other good friends, being

excited and assisted by the French, will most likely involve us in a ruinous war. I thank God, by the late changes in our Government, we are likely to have a very clever Council. Mr. Hastings' abilities are known, so that, if we are to be troubled, we shall be better steered than we have been."

"The French settlement swarms with Europeans; and lately they have entertained a great many Natives, as Lascars, who are all gone in the ships to Mauritius, where I dare say they will be thoroughly disciplined, and having once removed from home, they will not be likely to desert, on orders to march here or there. Thus every thing they do carries the face of some deep design. Our Council has had so many French connections, and so many inter-marriages, that the late Governor looked upon the French as friends, and they almost rode us, out of pure regard. Time will shew what the present set will do. I think they suspect something; for since Hastings' arrival the 3rd Brigade has marched down, and will in a day or two encamp opposite Chandernagore. Next month is to give Hastings the chair: swiftly may the minutes fly, and quickly may the hour come! They say, and I firmly believe it, that the present Governor is a man of the most amiable and angelic private character; may I ever be governed by men who have some resolution in their stations. My sentiment is, that a good Governor may be of a bad private character; and a man of the best private character may be a bad Governor: because the head is concerned, and the heart should be full of public virtue."

In the year 1770 a dreadful famine visited the Company's Provinces in Bengal; and one third of the population of the country was computed to have perished.

Dreadful
famine of
1770.

A.D. 1772. ed. During the preceding year, the fains had been partial; the Company's Government was not popular; and cultivation had been neglected. When grain began to be scarce, an impolitic proceeding of Government, in consequence, was attended with the most fatal effects. Colonel Pearse thus introduces the circumstances in a letter to General Pattison, 1772,—

“The pernicious system of supervisors was his (Mr. Cartier's). The event has proved that I and many others judged rightly of it. That the famine was more artificial than real must be evident from these circumstances: viz: at Buxar the river is cannon shot wide for a 3 Pr. Buxar is in our district; the country opposite is part of Sajah ul Dowlah's dominion, a fief held by the son of Bulwan Sing: his country abounded with plenty when we were in the utmost distress; and on his shores were well supplied villages, when thousands starved at Buxar. He kept his country so because he would not allow of that exportation which was desired to be made; had this plentiful country been in our hands, and subject to an English potentate (supervisor), the whole produce would have been seized, and either sold or exported. Within every district every man is obliged to offer the produce of his lands to the supervisor, at his price. Without leave of this tyrant there is not a man who dares to buy or dares to sell, as I know by experience; even to fowls, rice, every thing.”

“In that country there hardly is a square mile uncultivated, and it everywhere swarms with inhabitants. In our's, cottages are hardly to be found—whole villages are deserted—the country is waste. The men who had influence, have not enough now even to command respect as gentlemen: their riches are daily decreasing; or those

who, will not submit to waste their substance daily flee A.D. 1772. from this country: so that in a little time we shall have land enough and not be able to get food from it. When God gave rain, and plenty was likely to follow, and the rice was cut, and grain began to be sold, then, and immediately the old rice, which before had been selling at 3 or 3½ seers for the Rupee, fell down to 8, and then to 10 or 12; where could it come from? for the new straw did not produce old rice, but new."

"That the Native Government would have made a scarcity by the same means, is certain, provided we had not been in power; but had the country been in its former state, and scarcity had been occasioned, we, by our power, would have opened the Magazines, and saved the multitude. But when the tyranny was in our own hands—when we alone profited by the miseries of others, we could not find it in our hearts to do good, because our purse must have been lighter. Had every man been free to sell, and been protected by us from oppression of the Native Government, every man who had a surplus would have carried it to market for a better price; but as the matter was, each man concealed as much as he could, and what was not concealed, he was compelled to sell to those who could and did lock it up to retail to the destruction of others. The very orders given at the Durbar, to buy up all the grain that could be got, and to send it to Moorshedabad, were the destruction of this country; for they were obeyed. The inhabitants could not get food in the country; they fled to the city after grain: but the grain was too well secured for them to get a mouthful, and the unfortunate people died by thousands. The Governor erred from want of judgment, and bad counsel; he did not share in the horrid

8077-

A. D. 1772. plunder; he is a man of good character and amiable in the extreme; but there never was a Governor less capable, less active, less resolute."

"Much I fear the distress of the country is beyond even Mr. Hastings' abilities to restore."

To General Desaguliers.

State of political affairs.

"Our insidious friends, the French, have been very active. They have persuaded the King to leave us, and he has done it; our wise people deny it, and say that it is his own caprice. The proofs are strong against the supposition; for the King never spoke publicly on the subject, till just before he went; it was not then known that our Ministry had patched up a convention, and we daily expected a French war. We have since had certain advices that the French had collected a great force at Mauritius; and that they intend to attack us here, is beyond dispute, seeing that they sold off their effects, and sent to Mauritius all the Bengal pilots: nay, we now know that there is still a great force at Mauritius, and the King is certainly in motion. His going was nicely timed, and by the message he has sent us, it is evident he does not mean to assist us, because he has demanded the provinces from us. Let this be weighed—what must be the conclusion? That it is the act of the French, and that the King and Mahrattas are in league with them against us. That Sujah ul Dowlah is an enemy in his heart, we well know—that he is much inclined to the French, is certain—he has been long arming, and is now in readiness to take what side he pleases. It is said his troops have mutinied for want of pay; these are only his sepoys, and he has said he never will fight us with infantry, but with horse distress and ravage us. He buys horses

wherever he can, and at any price. This shews he does A. D. 1772.
not want money, and the preparation shews what he intends: yet our Governor looks upon him as a fast friend, because he has refused to go to Delhi, and join the King, and says he will oppose the Mahrattas."

"To oppose us, he must assemble forces, horse, &c. We too well know that where there is a good understanding, the grimace of quarrelling is easily put on. When the King was going, he and Sujah quarrelled. Sujah invited him to dinner; the King accepted the invitation, and the entertainment was prepared. The King then refused to go for fear of being poisoned. Sujah observed, that if his Majesty was already so suspicious, even when he had the English army close at hand to punish him, that he would have greater reason when he would be absent from such friends. What a farce! Sujah with a dagger, waiting for an opportunity of stabbing us, pretends friendship, and a good opinion, to lull us into security; and we like fools swallow the bait. Now Sujah kept up the farce, by pretending to arm against the King; but he lets his infantry mutiny for want of pay, that he may use the money for arming horse, and filling his treasury. Our treasury is empty enough. Ten thousand horse would easily cut off our collection of revenues; and this Sujah knows; and we are all well acquainted, that without money, our sepoys will not stay: for as it is, they desert by hundreds if they are ordered to march either up or down the country. I wish time may prove I am deceiving myself, and that I have erred in my opinion."

Colonel Pearse had a severe attack of illness this Severe attack of illness and goes to Madras.
year, and was obliged to go to Madras for change of
air. He sailed from Bengal on the 30th November. This

A. D. 1772 trip restored him to his usual health. Of the climate of Calcutta, which we trust is improved of late years, he thus speaks in writing to his uncle Admiral Mann:—

“The air of Calcutta is in summer like a hot steam room; and in winter, like a cold steam house. All the air is in every season full of moisture, and of saltpetre. Do not wonder that it has acted upon my body.”

Early in March, however, Colonel Pearse returned to Fort William, and he thus writes to General Pattison—

“29th March.

“MY DEAR GENERAL,

Returns to
Bengal.

“I wrote to you from Madras by the Triton. I was then mending. Soon after, I heard all Bengal was in an uproar; and I set out by the very first conveyance to get back to partake of the general confusion. I arrived on the 8th instant; but where to find the confusion I know not. The Mahrattas are scampering about; but I believe there will not be a drop of blood spilt; nevertheless, a body of our forces is marched to support Sujah ul Dowlah and the Rohillas against the Mahrattas. This is necessary to keep them, our best allies, firm in our interest: for otherwise, they might take part against us by joining the Mahrattas. I have received orders to proceed to the army, and shall set off in two or three days to travel about 1000 miles on men's shoulders, which journey I hope to finish by the 1st of May.”

Letter to Admiral Mann.

“Fort William, 29th December, 1773.

“MY DEAR SIR,

Proceeds to
join the Ar-
my at Ram-
gaut.

“After traversing Hindoostan to overtake the Army at Ramgaut, and being disappointed by hearing of their

march back, in consequence of the retreat of the Mah- A. D. 1773.
rattas, I went from Allahabad to Phaizabad, the capital
of Sujah ul Dowlah's dominions, to meet the General.
There my dear friend Moore was taken ill of a disorder,
which, unhappily for me, ended his days, after he had
lingered from July to October. Thus was I deprived of
a friend whom I could trust, which is the greatest bless-
ing a man can have in Hindoostan. He died of the
liver; which was the disorder I labored under last year.
I myself was taken very ill at Sultanpore in August, and
again in September at Chunarghur. I do not wonder
at it. Moore and myself travelled post through the
violent heats, and were afterwards in tents during the
whole of the rains."

In another letter he says—

"When I left Calcutta, our army was encamped at ^{Effect of} ^{Battle with}
Ramgaut, which is about 50 miles from Delhi on the ^{the Mahrattas.}
eastern side of the Ganges, and about 150 from the
cataract, called the Cow's mouth. It is the source of
the Ganges: for there the stream first takes this name,
and there is the sanctum sanctorum of the Hindoos.
But before I had reached Allahabad, the Mahrattas had
retreated, and our army was on its march back. A few
shot were exchanged across the Ganges. Two or three
asses, a lame horse, and, I believe, an old tree were
hurt; and the cords of the tent of the Commander in Chief
were in danger. Thus ended the glorious campaign,
without my assistance; but it had all the effect of a
bloody one: for the enemy found we were in earnest;
and supposing they were not capable of coping with our
forces, they returned and left all their conquests (if the
country they overran deserves to be called so) to those
who chose to take them. The heat made it advisable

A. D. 1774. for our troops to do the same; and on the 1st July I found them in huts, called cantonments, near Sultanpore, which is a town on the banks of the Goompotre—a small river, confined in most parts within very steep banks of hard stony clay.”

“This place is about 25 coss from Phaizabad (or Oude), formerly a small village near Oude, and a garden of the Nawab’s, where he had a bungalow, (i. e. a house built of bamboos, and straw, and mats, lined with striped linen, or richest silks) which still retains, amongst the country people, the name of Oude bungalow. This is the residence and capital of Sujah ul Dowlah. Sultanpore was once a place of some note; it is now a heap of rubbish.”

Shameful
attack upon
the Rohil-
las.

The attack on the Rohillas took place this year; an event which will be an indelible stain in the records of the British Government of India: by which the liberties of an unoffending state were unjustifiably invaded, their country desolated, and the blood of the peaceable inhabitants spilt to satisfy the mercenary views of an insidious ally. Neither prudence, nor necessity justified this act; and humanity shrinks from the recollection of it.

There is not a darker stain in the Government of Hastings, not even the fatal persecution of the unfortunate Nuncomar; even Colonel Champion who commanded the English forces, in his despatches to Government, expresses his indignation at the atrocities his Army was witness to, which were committed by Sujah ul Dowlah and his troops. Colonel Pearse mentions the circumstances in these terms: “I was not permitted to go into the field; so I missed the famous Rohilla fight on St. George’s day, and had not a share of Colonel Champion’s honors.”

And to General Pattison he thus writes, with a true A. D. 1774. soldier's feeling—

“Here has been a campaign against the poor Rohillas, an independent people, bordering on the dominions of our ally, the infamous Sujah ul Dowlah. A battle was fought on St. George's day: in Europe it would have been called a cannonade; for there was not a musket fired by orders, the distance being too great. When the Rohillas retired, Sujah ul Dowlah's brave horse, which, whilst danger was to be apprehended, courageously guarded the rear, undauntedly moved up, and heroically cut down the running women, children, and unarmed multitude. However, the Rohilla Chief, the noble Hafez Rhamut Khawn, died like a soldier in the field; fighting in the noblest cause, the defence of his country and its liberties. A cannon shot deprived the hero of his life, and left his body to be insulted by the cruel, dastardly, wretched Sujah ul Dowlah, who, acting in character, caused the head to be brought before him, and then, like a true coward, insulted it by pulling it by the whiskers, and loading it with other marks of ignominy. My consolation in not being with the army was, that the war was unbritish. Britons, the most tenacious of their own liberties, were joining their powerful arms to conquer a free people, who neither had offended them, nor could offend: so remote, their country was unknown—so little desirous of quarrelling with their neighbours, that all their wish was to preserve their own peace. The only favor they asked was, that we would not draw our swords against them, but leave them to maintain their laws against the cruel invaders of their liberties. But alas! we heard them not; we fought and conquered; and a peace is now concluded, the parti-

A. D. 1773. culars of which are such profound secrets, that I would not for the world attempt to dive into them."

Stops at Allahabad.
Mr. Laurel a Member of Council arrives, and takes formal possession of Allahabad and Korah for the Company.

"I stopped at Allahabad, because the Army was on its return. Whilst I remained there, Mr. Laurel, a Member of the Council, arrived, and took possession of Korah and Allahabad for the Company, and sat at the Cutcherry. The next day I went off to Phaizabad, where the General was. About the middle of July he left that place to go to Benares to meet the Governor, who was coming upon a visit and business to meet the Vizier."

Arrives at Allahabad when a treaty was concluded between Sujah-ul Dowlah and Mr. Hastings, and Korah and Allahabad were sold to him for 70 lacs of Rupees.

"The country was entirely under water; the rains incessant; the whole, of course, very uncomfortable, especially to travellers. I followed the General to Benares, and should have accompanied him, but I was stopped by a fever. The Governor had arrived some days before I did, and the ceremonious meeting was over here. A treaty, by which Allahabad and Korah were conceded to Sujah ul Dowlah, for certain considerations, which you know better in England than I do. However, I was told 20 lacs down, and 50 in three payments. Mineer ul Dowlah, who was Viceroy of these provinces, died at a very great age, soon after the Governor, &c. left Benares: it is said of vexation and grief; but I believe age to have had a much greater share. Thus I happened to be present at some very interesting transactions, which may possibly afford conversation at home. I shall not make any remarks. It suffices that I relate what I saw and know."

Returns to Fort William.

Colonel Pearse afterwards went to Chunarghur, to survey the stores and garrison; and then returned to Fort William.

Sir Robert Barker goes home—is

Sir Robert Barker, about this time, resigned the Commander-in-chiefship and went home; and was

succeeded by Colonel Chapman, who also resigned on A. D. 1774. the 18th January 1774, and went to Europe. He was succeeded by Colonel Champion in the command of the Army.

The Parliament of England had established a new Council to direct affairs in India, and on the 19th October the three new Counsellors, General Clavering, Mr. Monson, and Mr. Francis, arrived at Calcutta; and on the 27th October, General Clavering took the Chief Command of the Army. On the 26th November he reviewed the Bengal Artillery, which by this time was brought into an excellent state of discipline; and General Clavering expressed himself as delighted with the corps, and astonished at its performance, being superior to any thing he could have expected in India, and so much to his satisfaction, that Colonel Pearse writes to General Pattison, "The performances at the review would not have been a disgrace to dear old Woolwich."

To General Pattison.

"Fort William, 23rd February, 1775.

"MY DEAR FRIEND,

"Since my last, Sujah ul Dowlah is dead. Reports concerning his death are various; but what is current in the bazaar is the following: it is a translation of a Persian news-paper, which my Moonshee is now reading to me: '*Sujah ul Dowlah, having taken the daughter of Dundee Khawn prisoner, sent for her to his Haram, and attempted to violate her person. She had concealed a poisoned dagger, with which, whilst he was struggling with her, she stabbed him a little below the navel. He was for four months confined to his bed by the wound, which baffled the skill of all the physicians who went to*

A.D. 1775. *his assistance; and it was given out in the Bazaar that he had contracted an evil disease. But at length he died; and just before his death he caused the daughter of Dundee Khawn, before mentioned, to be strangled.* This is nearly literally translated; as nearly literal as a translation can be; but mark, I do not vouch for the truth of it, whatever I may believe; and I would not have written this but to shew you that he did not bear the best of characters, and so to induce you to believe that I did not much exaggerate in my last letter of the 27th November."

"His son, Asoph ul Dowlah, has succeeded, and in all probability will continue to reign over Oude, if his enemies are not powerful enough to drive him out; and that I believe will not be, though I should not wonder if the Mahrattas, Seiks, Jaats, and Rohillas should join the King, and force him to carry a war against us; and indeed, the same bazaar news-paper says that they actually have joined, and marched with the intention to wage war with us."

"One part of their reasoning is absolutely false; for they say the English have actually coined Sicca Rupees in the name of their own King. The Mahrattas, however, cannot gain any thing but by war and confusion; before we had the country, they received a fourth part of the revenue."

"Sujah ul Dowlah had, with our assistance, kept them at a distance and taken possession of Korah and Allaha-bad, which the King had given to them. Again we have attacked them and taken Salsette, so that they have every thing to hope and nothing to lose by a war; we, on the contrary, have nothing to gain."

"The King surely has not any reason to love us, A. D. 1775. since we have ceased to pay him the stipulated tribute, and taken Korah and Allahabad from the Mahrattas, to whom the King had given them; so that he has nothing to expect, and, God knows, not any thing to lose."

"I was disappointed of my second review. It was resolved, on Sujah ul Dowlah's death, to march another Brigade towards Patna, and to station it at Dinapore; but when the order was to be issued, it was found that there were not any tents ready; for this reason they were under the necessity of taking those in which my corps was encamped, to carry on practice; and we are, therefore, marched into the Fort from Dum Dum, after having fired a fortnight, instead of two months; nevertheless the General twice saw us; and though it was the beginning, and the powder is the worst that ever was seen, yet he was well satisfied with our performance."

Want of
camp equi-
page in the
service.

"Lieut. Col. Keating, I find, has obtained a release from the shackles which the Court of Directors formerly laid on all their Artillery. He is to rise in their Bombay Army to any rank to which it may be his turn to rise."

"The death of Sujah ul Dowlah, and the taking of Salsette, are the only news here: whether these accidents will embroil us or not, time will quickly shew."

"I like the country, climate, and people. I have good health—plenty of all good things—ease and cheerfulness. My spirits never flag now, since I have taken water, which alone I drink. I am totally changed. I know not how to grumble or complain now; so that though you may hear me do so upon occasions, you may pronounce me not unhappy. I earnestly wish you health, and happiness, and honor, and riches, in the war which I suppose will be the consequence of the death of the

A. D. 1775.
Remarks*
upon Iron
Guns.

King of France. You ask me about iron guns; we have a great many here; I know not where they were cast, but I know they are very indifferent. Two 12 pounders burst on the ramparts in 1770, in firing the morning and evening gun; and one 12 pounder burst on a rejoicing day in firing salutes. It destroyed 7 Europeans, and 14 or 15 Natives."

"I excommunicated these iron guns, and substituted brass ones for salutes; and I proved those of the iron guns which were to be used. They would not bear 9 lbs. of Europe powder; they stood 8 lbs. only; 1 out of 30 burst with 8 lbs., and 3 out of 5 burst with 9, which was for experiment of their real strength: for as they were short 12s, and would be medium in thickness, 8 is the proof proportion; for I do not approve of trial by quantity. All guns should be proved by proportion, and not by arbitrary quantities; for which no good reason can be assigned, except that Carpenter Hartwell approves of it. Cartridges are made by proportion;—ergo, the proof ought to be so."

Contrives
an instru-
ment for
laying mor-
tars, and
fixed screws
to mortars,
to elevate
them.

"I have contrived a method of using the quadrant on the outside of the mortar,* which at the same time gives a sight to lay them by; and I have fixed screws to all my mortars to elevate them by, from 28° to 90° ; and they do not fall back, though they are never lashed; and I have introduced the Desaguliers; and hit a target of 8 feet square, 9 times out of 14, at 200 yards in 8 minutes; and 9 times out of 10, in 10 minutes. I have taught my corps to make all things as they are made in the dear, dear Warren."

It was natural to expect that the new counsellors would not be received with open arms by Mr. Hastings,

* A description of this Instrument will be given in a future number.

as it was generally reported throughout the settlement A. D. 1775. that they came out to prevent abuses which had prevailed. They were anxious to possess themselves of all information regarding the late transactions of Government; and upon a part of the papers relating to the Benares treaty, and the Rohilla war, being withheld from their examination, on Mr. Hastings' plea of their being private and confidential between himself and Mr. Middleton, Agent at the Vizier's Court, an open rupture and division took place.

The Council now consisted of Mr. Hastings as President, and Mr. Barwell, on one side; and General Clavering, Mr. Monson, and Mr. Francis, at determined variance, on the other. Colonel Pearse, being warmly attached to Mr. Hastings, may be considered as writing, in all his letters which concern him and his Government, with those feelings of partiality which a knowledge of these circumstances would presuppose. Perhaps no man's character was ever so enigmatical as Mr. Hastings's, and in no cause were adverse parties and feelings ever more warmly agitated.

Colonel Pearse's correspondence breaks off for a time at this period. The unhappy internal dissensions which prevailed, were carried to so high a pitch, as to threaten the very existence of the British Government in India, and all confidence in private friendship was at an end. During this interval, however, poor Nuncomar suffered; of which Colonel Pearse, probably as he could not approve, never makes mention in any subsequent letter. General Clavering, Colonel Monson, and Mr. Francis constituting a majority in Council, the reins of Government had fallen into their hands, and their constant object was, to oppose Mr. Hastings in every instance.

A. D. 1775. In May 1775 he writes in a short letter to General Pattison—

“I make it a rule never to write news now, because our letters are most commonly opened, as I am convinced this will be, because it will be expected that every body will be writing about the dissensions which prevail amongst us. I endeavour to steer clear of either party, because I love both; but though I am silent, the public papers will be full enough; and you will know all, perhaps better than we do on the spot.”

November 1775.

Persecution
of Mr. Hastings
by the
opposite
party.

“Poor Hastings! dear Hastings! worthy man! the friend of the Company, and their service! the guardian angel of the settlement, has been harassed, abused, beset!

“In the Military line Mr. Hastings’ power is greatly curtailed by General C——; he chooses to be an enemy to every one distinguished by the Governor’s friendship, or who distinguishes the Governor for his friend.”

“Let us hope for better times, and in the mean time be as happy as we can.”

“Those who either loved or were loved by Hastings, became immediately the object of C——’s hatred and resentment. Hastings had been my friend before C—— arrived; and I esteemed him too much to do as others had done—that is, turned their backs on their old friends to court their new ones. C——, therefore, marked me as one of the Government set, and accordingly he has uniformly done every thing to thwart and hurt me, and every thing I have asked for myself he refused.”

Institution
of the Board

He instituted a Board of Ordnance, and made me a member of it; took all my authority away, and made me

a cypher. I was hurt, and complained, as he had put A. D. 1775. into the Board a Lieut. Colonel Dow, the translator of a of ordnance, the present miserable history of Hindoostan, and the author of two military Board. wretched plays. This man is Commissary General. The Commissary General is Controller of the Military Accounts. He uniformly attacked me and my department; and I defended myself and officers. This created disputes; and as I was wounded, I was warm; and thus, because my opinions were always contrary to D——'s, and D—— is the General's tongue, brains, head, and heart, it was as bad as attacking the General himself."

"By heavens I speak truth without a word of exaggeration! the three who came out hang together, and of course every thing is given to their own set. If ever I spoke truth in my life, I do it now."

"Lady Ann Monson is a fine old lady; every body likes and respects her, the Miss Claverings, and the old Lady: the two former are divine creatures, and the latter very agreeable. With this addition to our settlement, if the General had abided by his first declaration that they were not sent out for retrospection, but to prevent errors in future, we should have been very happy; but when the General heard informers, and learnt the abuses which in the unsettled state of the country were unavoidable, he immediately conceived that there were not any honest men, except those who gave the information; and blinded by his jealousies, his passions, his avarice, and his disappointment, he took for zeal what proceeded from the very worst of principles: for there never was an informer, who was not such from malice, avarice, or envy, either separate, or conjoined.

A. D. 1776. "I so much detest the principles and name, that even if I knew of evil I would conceal it, rather than deserve this epithet; but this very honesty of principle makes me still more unfit for his purposes, and increases his hatred."

"The Board of Ordnance first met in May 1776."

Death of
Col. Monson
Nov. 1776.

Early in November 1776, Colonel Monson died, and thus from Mr. Hastings' casting vote, the power again came into his hands.

Several shocks of earthquake were felt this year in India; one of them is thus described: Colonel Pearse writes to General Desaguliers—

"18th December, 1776.

Earthquake
at Calcutta
in 1776.

"On the 8th instant we had a shock of an earthquake. It began with a shaking of the earth which made the windows and venetians rattle extraordinarily loud 20". I sat patiently and heard the noise; and then, having found what was the cause, I ran out, and when I had reached the ramparts, I felt the earth in violent motion, wave running after wave, not perceptible to my eye, it being dark."

"The earthquake began at 7h 46m 5s; the grand wave stopped my astronomical clock at 7h 47m 15s; at 7h 49m all was over. At Chittagong the shock was felt at 8h 8m; at Patna about $\frac{1}{2}$ past 7: now the first is east of us about 20', and the latter west about as much: this shews, the difference of latitude considered, that the shock was instantaneous, through a track of above 800 miles. At Chittagong it made the water rush on the shore like a large wave, which suddenly rose and fell from 3 feet to 7. This is the most violent earthquake I have ever felt, and I have felt several: two this year before it, and one the same evening at $\frac{1}{2}$ past 9."

"Doth not the instantaneity of the shock, or agitation A. D. 1776. of the earth through so vast an extent, plainly prove that a real earthquake is perfectly an electrical phenomenon? To me it is most evident, and the more I consider the subject, the more I am confirmed in my opinion. A real earthquake I distinguish from those in the neighbourhood of volcanos. These I call shakings of the earth; and they may be occasioned by both causes: that is, either by electricity, when the volcanos are not in violent irruption, or by the violence of the explosion when they are."

To Mr. Muller.

"January, 1777.

"I have made a simple instrument for describing parabolas and hyperbolas. I will send you drawings of them. I intend sending it to the Royal Society, together with some astronomical observations." Invention of an instrument for describing parabolas;

"I must tell you too, that I have contrived a method of grinding specula to the shapes of all Conic Sections, and my machine will be set to work soon for that purpose. and for grinding specula. Last year I sent to Dr. Maskelyne a complete meteorological journal of the weather for one year; and shall send him also the construction of my wind-gage; notwithstanding Dr. Lind of Edinburgh has been taught by his country-man, Captain Kydd, to make one of the same kind, but portable. Mine was drawn in 1774, and shewn to Kydd, and in 1775 Lind's was printed in the Philosophical transactions. I shall take care to secure my Parabolic compasses, by sending them before any body can give an account of them.

"You mention in your Artillery, tubes which fire the cartridge without piercing it; such were in use here Tubes for cannon.

A. D. 1777. when I arrived. They are only common copper tubes, lined with mealed powder, so as to leave a free passage through the middle of the powder, and it is inconceivable how great the force of the fire is. The flame strikes through the thickest cartridge. They used to prick the cartridge, but I have left it off, and cut the tubes shorter, and they never miss when they are good; but my labors are all in vain here: I cannot get thanks; at home, I should get money and thanks too."

"24th March, 1777.

Corps of
Artillery
reviewed
by Mr. Has-
tings and
Gen. Clav-
ering.

"I have had my corps reviewed twice: first, by the Governor, who was excessively pleased, and thanked us in orders; and next, by the General, who also thanked us. It was our good performance forced the General's thanks; he would have been better pleased to have found fault: first, because we pleased the Governor; next, because I commanded and had myself disciplined them."

To General Pattison.

"25th March, 1777.

"MY DEAR FRIEND,

Invention
of an instru-
ment for
laying mor-
tars.

"I have had the good luck to invent an instrument for laying mortars; and I have applied a screw to elevate them; all which, as it is red hot from the forge of invention, must be new to you."

"I have so little interest with the Directors, that I thought it might be of service to send home a full description of the contrivance: especially as it has answered my most sanguine expectations, and has surprised every body here."

"I shewed it to the Governor at the review, which honor he conferred upon the corps. Captain Farmer of

the Royal Navy was there. He saw how well it answered. I believe I really was happy that day. Not one circumstance had I to lessen the pleasure I received from the good performance of my corps, as a Battalion of Infantry, as a Battalion of Artillery with 16 cannons, and as a body of Artillery on service in their batteries: for we went through all these exercises, and equally well."

"The Saturday following, General Clavering reviewed us, and what gave me most pleasure was, to hear that he had said in private, he had reviewed most of the King's Regiments, and never saw any perform better."

To General Desaguliers.

"26th March, 1777.

"The news-papers have astonished me. I there find that a gun of your invention has been fired 22 times in a minute. Although it is impossible any gun can stand this 10 minutes, yet it is an amazing performance, nor can I conceive how it is done."

Astonishing
gun of Gen.
Desagu-
liers' inven-
tion.

"I have introduced your instrument, and we can hit a target 8 feet square, at 200 yards, 9 times out of 10; indeed when once we have hit it, it is very difficult to miss; and we fire 10 rounds in 8 minutes."

Introduced
the Desa-
guliers,
now called
the Tangent
scale.

To Sir Robert Barker.

"25th March, 1777.

"I have written to Pattison, and to Desaguliers, and to my friend and preceptor Muller, on the subject of an instrument of my invention for laying mortars."

"I have to apologize for the liberty I take in sending a box to you, but more so when I come to make my request that you will present the contents of it to the

A. D. 1777. Royal Society, of which I understand you are a member.

The box contains a model of an instrument for describing parabolas, with the alteration necessary to make it describe hyperbolas. I send it, though in an unfinished state, to secure it to myself, lest I should be

ColPearse's claim to the invention of the wind-gage described as Dr. Lind's in the Transactions of the Royal Society and Rees's cyclopedia. served as I was about my wind-gage. There is one so exactly like it in the Transactions, from Dr. Lind of Edinburgh, who does not say it is his own invention, that from the time it appeared, and from the discourses I had with Kydd, whether a fluid would not be better than a weight, that I cannot help thinking Kydd has sent home this instrument to Lind, or at least a full drawing of it. Now Kydd, having once seen it, made me several subsequent visits, and always about the wind-gage. His, indeed, is portable, and mine was for a weathercock; his is executed, and mine only drawn; but nevertheless I do conceive that I have a better claim to the wind-gage than he can have. The fluid, and the different fluids to be used occasionally, were all talked of here in very nearly the same words."

"You wish for the dimensions of the Observatory at Benares: I will send home a model of it next year, to be presented to the Royal Society, if you please; for I shall send it to you as your own."

To Mr. Muller.

"26th March, 1777.

"Are all our Artillerists asleep? I do not hear of any improvements at home: for I cannot think the introduction of a paltry 3 Pr. upon a galloper carriage is one, though Congreve constructed the carriage, and Phillips is the patron of the gun. The people in this country use swivels, which they fire from the backs of camels. The

creature kneels down for the man to point the gun. Now A. D. 1777. I am persuaded this is as good as the 3 pr. flying gun. Perhaps if somebody would put it into Phillips' head, he might persuade Lord Townsend to send to Arabia for camels, unless he has caught the contagion and believes that all are rogues, knaves, and fools on this side of the sea. I hope it was not a specimen of your good things, the virtuous, or the noble, that was sent out to us for our general Council in 1774. They gave but a bad idea of the produce of your Island."

In consequence of the death of General Sir John Clavering, in August 1777, Brigadier General Giles Stibbert, became provisional Commander-in-chief, and Colonel Pearse writes to his uncle Admiral Mann—

Death of Sir John Clavering, and succession of Gen. Stibbert.

"Fort William, 16th January, 1778.

"I told you how miserable Clavering made us; in joy of heart I tell you he is no more."

"Mr. Hastings' Agent had made what he thought a surrender of the chair at home; the Directors had accepted the resignation, and Clavering was to succeed: but it was all provisional; it was not to take place without his pleasure; his resignation therefore was not complete: what they had granted was merely leave to resign if he pleased."

Account of Gen. Clavering's attempt to usurp the Govmt. of Bengal.

"On the receipt of the news which arrived on the 19th June 1777, the old man demanded the keys, and looking upon himself as Governor General, he actually took the oaths and summoned a council in his own name. Mr. Hastings, who was the real Governor, and who had not resigned, and Mr. Barwell, composed the majority in Council; and they took the steps necessary to prevent the

A. D. 1778. Madras game* from being played. But matters were here quite different: the whole settlement adored Mr. Hastings, and as perfectly detested Clavering; the whole Army were of the same way of thinking; the Judges gave their opinion unanimously, that the Chair was not vacant, and the notification of this opinion gave universal satisfaction. Such was the unanimity of the Army against Clavering, that his attempts to form a party were absolutely vain. The chagrin this defeat occasioned sunk deep into his mind: from that day the seeds of death began to shoot—his inveteracy increased—he began to talk of what he would do—whom he would make repent—and so forth; but death stepped in and stopped his career and saved your friend: for I was one who was to have been sacrificed to his resentment and malignity.”

“Peace now reigns amongst us; we are again a happy people. Clavering’s name is hardly ever mentioned, and never with respect, except by five or six at most; I mean of those who do yet remember him; but the greater part know they have escaped from a great danger. His opinion of all who were here before him was uniform; and though to carry on business he was obliged to select some, yet they all knew he meant to fill their places by another set, which he hoped to obtain from England. It may be said this is mere supposition; to prevent which, take this which follows as a proof:—

Gen. Clavering’s
conduct to
the Army.

“About 15 commissions for Captains were vacant, with others also in the inferior ranks. As was always usual, it was proposed to fill up the commissions before the ships arrived, to prevent the mortification which must be the consequence of appointments from home,

* The arrest and imprisonment of Lord Pigot in 1776, by his opponents in Council at Madras.

and which would be infinitely worse if those were superseded for whom commissions had been long vacant. To this he objected, and urged as a reason, that he expected officers from England to fill the vacancies. You need not wonder now that the whole army took the alarm, and looked upon the man who ought to have been their protector, as their inveterate enemy; they did so, and he felt it to his death."

"The promotion took place to his great mortification. As I had several vacancies, I used my utmost endeavours to get them filled; and this he called, taking an active part against him. I gave him the list for promotion; he muttered something, the words of which I could not hear, but the meaning was, he would not forward it; but as he found the promotion would be moved and carried, he was at length forced to give in the list."

"Thus, doing barely my duty gave offence, and was deemed taking a part against him. Under such a man who could hope for justice? but gone he is, and may we never fall under the lot of such another!"

To General Pattison.

"You were preparing to go to the India House about the Madras revolution; very nearly had we one in this place, but the hatred of all ranks for the deceased prevented his using the Military power to take by force the Chair, as was done at Madras."

Another account of Gen. Clavering's usurpation.

"The General, by the advice of one Folk, sent to demand the keys from Mr. Hastings. He also summoned a Council in his own name, as Governor General, and before the only Member of Council (Mr. Francis) who attended, and the Secretary, this Folk, and one Laccam, he took the oaths and usurped the Chair; he

A. D. 1778. sent for the Persian translator, and ordered him to translate a proclamation into Persian, and to make known his appointment to the Chair; and he drew out orders for the Garrison to acknowledge and proclaim him."

"The Persian translator, Sir John D'Oyly, a man of great spirit, truth, and honor, begged to decline doing it, till he knew the authority, as hitherto he had not been acquainted with any change of Government. The General gave his own orders, and shewed him the paragraph of the Directors' letter, on which he grounded this right to the Chair. Sir John read it over very attentively, and more than once, and then politely again declined; being ordered, he refused and left him. Whilst this was transacting at Government House, Mr. Hastings was sitting in Council of Revenue with Mr. Barwell, at the Revenue Council House, carrying on the common business, and little suspecting that it had entered the General's mind to act the farce that was carrying on; but he was soon obliged to lay aside the Revenue business to consider a letter which he there received from General Clavering, demanding the keys, and declaring himself to be Governor General. He instantly took the necessary precautions, sent his orders into the Fort to the Commanding Officer to prevent his being surprised into any act of disobedience by the orders he might receive from General Clavering, acquainting him that the General demanded the Chair and keys, that he had sent to inquire the opinion of the Judges, and was determined to abide by their opinion; but in the mean time he commanded that no other person should be received as Governor General, and that General Clavering should not be suffered to enter the Fort. I happened to be second in command, and was

accordingly sent for. The guards were strengthened, A.D. 1778. the gates shut, and it became necessary to endeavour to find how men stood affected. A few moments were sufficient to do that; for unanimity prevailed, and all equally dreaded the change. The Judges unanimously declared their opinion, that the Chair was not vacant; that Mr. Hastings' resignation was not, nor could not be full at home; that all the orders from home indicated that it was something to be done in future, and at his own option; not completed, nor binding on him to complete it."

"The consequence was that Mr. Hastings and Barwell declared his (General C——'s) Commission null and void, made so by his own acts; and they therefore declared that he should not again be summoned to Council, or hold any command or power whatever."

"The Judges, however, gave it as their opinion that there was not in India any power competent to remove a Member of Council from the Board."

"To shew the moderation of Mr. Hastings, he acquiesced in the opinion of the Judges, and suffered the General, or Governor General self-elected, to resume his command and the functions of his office."

"His death, however, soon relieved us all, and I esteem it to be the luckiest event that has happened to the Company, if not to the nation."

"General Clavering I know you told me was your friend; it may therefore seem presumptuous in me to say so much, but I merely narrate, and adhere to facts only, which could be asserted by numbers. You know Clavering as a private gentleman; I know him as a man in power: this make the difference between our opinions; for certain it is that power changes the nature of men

A. D. 1778. totally ; and the more I examine men and manners, the more I am convinced that every man has his price, and that we all should show how prone the heart of man is to evil, if our price were offered."

Proclamation of Gen. Clavering's knighthood.

"General Clavering's knighthood was proclaimed by a salute of 17 guns, on the 1st July. I went to him at the head of my corps on that day, and addressed him thus: 'Sir, The corps of Artillery which I command, beg leave to pay their respects, and to congratulate you on occasion of the honor which His Majesty has been pleased to confer upon you.' He hardly bowed, turned from me with a frown, and selected from my corps a subaltern officer, whom he accosted by name, took him by the hand, inquired how he did, then turned short from twenty officers and myself, who had waited on him, without another word. After some little time the whole retired, shocked at the incivility they had met with. The other corps avoided the like mortification by not going."

Account of professional studies.

"I have not neglected my professional studies, I assure you, as I hope my new mortar instrument will shew you. You may judge of the labor I had to make these instruments which I have now completed, one for each mortar, when I tell you that there is not an instrument maker in the country, and that I have been forced to bore Barometer tubes to make my levels. I was first obliged to contrive how, and then to teach others the method; after which I was obliged to learn how to close and fill them: but difficulties soon vanish when a man is resolved. The dividing the quadrants I am obliged to perform entirely with my own hands; and so I am forced to put them together, and adjust them for use. Thus I have been obliged to learn a trade; per-

haps it may be lucky for me, as I may be forced to A.D. 1778. quit this service to earn my bread elsewhere."

"Fort William, 18th January, 1778."

Colonel Pearse during this year paid great attention to the interior of Fort William, proposing many alterations for the purpose of better providing for the health and comfort of the Garrison; also several very able memorials, shewing the state of the corps and praying for alterations, were submitted to Government, the subsequent adoption of which have tended in no small degree to the prosperity of the corps.

In the beginning of 1778, a detachment of Artillery A detachment of the Artillery under Major Bailey, called the Bombay detachment, went on service from Bengal, with an Army under under Major Bailey. Colonel Leslie.

This force was appointed to march across India to support the Bombay troops in restoring Ragobah in the Government of Poonah.*

In consequence of the want of European Artillery several companies of Golundauze, or Native Artillery, had been raised at the suggestion of Colonel Pearse, and brought into fine discipline; and the following order, which was issued by Lieut. Colonel Goddard in camp, reflects very high credit upon the corps; as a part of them marched with Colonel Leslie's detachment. Colonel Leslie dying on the 3d of October, Colonel Goddard had succeeded to the command.

Copy of order by Lieut. Colonel Goddard, 1st November 1778—

* For the History of this unfortunate chief, see Forbes' Oriental Memoirs, and 5th Book of Mills's History of India, 15th, 16th, and 17th Chapters.

A. D. 1778.
 High testi-
 mony of the
 fidelity of
 the Golan-
 dauze, or
 Native Ar-
 tillery.

“The unmilitary and unexampled spirit of disaffection to the service, which has so manifestly displayed itself in the frequent desertions from the corps of Cavalry and Infantry within these few days, is become a matter of the most serious and important consideration.”

“The Commanding officer, therefore, thinks it necessary to declare his sentiments upon the occasion fully to the Army, and to express the indignation and surprise he feels at such conduct, as well as the astonishment and displeasure the report of it will create in the minds of the Honorable the Governor General and Council, after the particular indulgences they continue to confer upon the Sepoys in their service, by the superior pay and other advantages they receive above all other troops in Hindoostan, which they enjoy at ease and luxury within the Company’s provinces for years.”

“This is a proof of ingratitude too striking and too injurious to the characters of soldiers to admit of any excuse; that under the circumstances of our present situation, with the probability of an enemy to feel the force of the British arms, they should hourly desert their colours from which they have derived, and still may derive, a plentiful support, on account of the partial inconveniences to which they are subjected on any particular occasions of active service.”

“The Commanding officer, with much pleasure, excepts the corps of Artillery in the foregoing observations. Their steadiness, fidelity, and military conduct claim his particular thanks; and he desires the Commanding officer will assure himself that he will make proper mention of their merits to the Honorable the Governor General in Council.”

In July, 1778, intelligence was received in Bengal A.D. 1778. that hostilities had commenced in Europe between the French and English. The public declaration of war, however, had not reached India; notwithstanding which, the British Government of India, not doubting the fact, and conceiving the act justified by prudence, seized upon the French settlements of Chandernagore, Masulipatam, and Carical; and sent an Army against Pondicherry, which was the only strong place of arms remaining in possession of the French in India. Taking of Chandernagore.

The Madras Army took the field, under Sir Hector Munro, to lay siege to Pondicherry, on the land side; and the British squadron under Sir Edward Vernon sailed from Madras to attack the settlement by sea. The French squadron under Monsieur Tronjolly, of superior force to the English, was attacked on the 10th of August; and though the fleets were engaged upwards of an hour with great fury, the only advantage gained on the part of the English was, that the French ships sheered off, and the English, being disabled in their rigging, could not overtake them. Siege of Pondicherry.

Sir Edward Vernon, having refitted his squadron, sailed into Pondicherry Roads on the evening of the 21st, which the French fleet did not oppose, and under favor of the night escaped. The public notification of the war did not reach Bengal, however, until the 29th November following, when Colonel Pearse writes to his uncle, Admiral Mann, as follows:—

Fort William, 30th November, 1778.

“The war which we heard of yesterday, I mean the declaration, (for we have taken Pondicherry and Chandernagore, and are gone against Mahè,) will, I presume,

A. D. 1778. so much employ you, that I hope you will excuse my sending home a power of Attorney, making my friend Lionel Darrel my joint Attorney with you, as the war which is to rage for these 10 years, perhaps, or until Carthage is destroyed, will no doubt give you full employment."

To Lionel Darrel, Esq.

"Pondicherry fell in October last, after a siege that made us all despair. We fitted out a fleet, if four ships may be called so; two of 40 guns each went to assist at Pondicherry, under Joe Price, the other two fell down a day or two ago under Richardson. Our Army was augmented, and my corps came in for its share; two companies were added, and three battalions of Native Artillery, called Golundauze; they are in fact the same we had, being raised from the pick of the Lascars, but with European officers to command them."

"Three regiments of Cavalry were raised. Goddard is the Lieut. Colonel Commandant of the Cavalry Brigade. Leslie was on an expedition with Goddard. Leslie died—Goddard commands it—Stibbert commands in chief—Ironside is coming into command here—Morgan commands at Berhampore—Hampton (now a Lieut. Colonel) commands at Cawnpore—and Upton at Chunar; these are all my seniors now."

"Our fleet had a fight with a very unequal French fleet off Pondicherry; and though we were deemed the victorious party, we could not boast of any decisive advantage at sea, till one of their fleet was taken, and the rest, in consequence, went off. By the time this happened, Pondicherry was either invested or nearly so. The batteries were opened on the 17th September with

23, cannon and 27 mortars; and the place surrendered A. D. 1778. on the 19th October after a most gallant defence, and a very tedious siege."

"The capitulation will disgrace our annals for ever. Bellcombe called us *banditti*—said we attacked before war was declared—and at last, made us confess we were what he called us, by stipulating that the place should not be destroyed till we knew there was war—glossed it over by saying, 'till we receive advices from Europe.' An army is gone against Mahè, the only place, the French have left."*

In November 1778, Colonel Pearse received intelligence of his father's death, at an advanced age. The ease of his latter days had been secured by constant annual remittances from his son, not only for his own support, but for a daughter's, the sister of Colonel Pearse, for whose maintenance he continued to send home a handsome income.

Intelligence of the death of Col Pearse's father.

The Councils of Bengal and Madras were at this time struggling with internal dissensions, giving rise to all the violence of party spirit amongst the European population of the two Presidencies. Violent as these were, and destructive of the peace of the community, another source of animosity now appeared, originating from the proceedings of the Supreme Court of Judicature and its attempts to extend its jurisdiction.

This Court had been constituted by act of Parliament in 1773. The Judges were appointed by the King; from which the power of the Court emanated. The Court was framed of a Chief Justice and three Puisne Judges. It was a Court of Common Law, and a Court of Equity

Account of the Supreme Court.

* Mahè surrendered on the 19th of March.

A. D. 1778. a Court of Oyer, and Terminer, and Gaol delivery; an Ecclesiastical Court, and a Court of Admiralty.

The principal object of the Parliament in constituting this Court was, to secure the pure administration of the English Law to the subjects of the British Government in India, and by appointing Judges on fixed and liberal salaries, to prevent the abuses of Judicature, by securing the emoluments of the Judges from increase or diminution by the payment of fees. The Parliament enacted that a sufficient salary should be fixed for the Judges, and that no additional emolument in the shape of fees by suitors, or in any other form, should accrue from their judicial functions.

The principle was honorable to the Parliament of Britain; but when the King's Court proceeded to act in India with unlimited powers, the authority of the Supreme Council of the East India Company was paralyzed. The clashing of the two authorities had been foreseen by many, but the Parliament had neglected to provide against it, by prescribing bounds for either.

The Supreme Court began to exert its unlimited sway in 1774, and held out to the Native population, that they had all the rights of free Englishmen, and that in point of law there was no inferiority. That their power was above that of the Courts of the East India Company, and that the Natives were at liberty to throw themselves, for redress from the sentences of these Courts, upon the Supreme Court, where they would obtain redress and protection.

It may well be supposed that this language to the Asiatics, whose forefathers for generations had been accustomed to despotic government, was not very applicable to them, nor could the Natives readily apply it

to use, as they could not comprehend the *bonus* which A.D. 1778. the Parliament of England had given them. Ridiculous as well as distressing and vexatious misapplications of the blessing on their part daily occurred, in which it was discovered too late, that the authority of the Supreme Council was set at nought.

Moreover, the principles of the English law were in many instances at direct variance with their religious and moral laws; and the Natives, both Hindoos and Mussulmen, soon began to look upon the operations of the Court with horror and consternation.

The evils, (says Mr. Mills,*) not of apprehension merely, but of actual suffering, to which it exposed them, were deplorable. They were dragged from their families and affairs, with the frequent certainty of leaving them to disorder and ruin, any distance, even as great as 500 miles, to give bail at Calcutta; a thing which, if they were strangers and the sum more than trifling, it was next to impossible they should have in their power, or be consigned to prison for all the many months which the delays of English Judicature might interpose between this calamitous stage and the final termination of the suit. Upon the affidavit, into the truth of which no inquiry whatever was made—upon the unquestioned affidavit of any person whatever, a person of credibility or directly the reverse, no difference; if the individuals prosecuted were within the jurisdiction of the Court, the Natives were seized, carried to Calcutta, and consigned to prison; where, even if it was afterwards determined that they were not within the jurisdiction of the Court, and of course, that they had been unjustly prosecuted, they were

* See chap. 6, Page 561, Mills's History of India.

A. D. 1778. liable to lie for several months; from whence they were
• dismissed totally without compensation.

Instances occurred in which the defendants were brought from a distance to the Presidency, and when they declared their intention of pleading, that is, objecting to the jurisdiction of the Court, the prosecution was dropped; in which case the prosecution was again renewed, the defendant again brought down to Calcutta, and again, upon his offering to plead, the prosecution was dropped. The very act of being seized was, in India, a circumstance of the deepest disgrace, and so degraded a man of any rank, that under the Mahommedan Government it was never attempted, except in case of the greatest delinquency.

It was soon found that the payment of the revenues was evaded by the Natives; and the public servants of the Company, in endeavouring by the customary modes to obtain payment of them, subjected themselves to the operations of the Supreme Court, and were apprehended for trial and brought to Calcutta; and this threat was held out in terrorem over all the Company's servants.

The Judges at this time were, Chief Justice Sir Elijah Impey, Mr. Justice Hyde, and Mr. Justice LeMaistre.

The King's Judges at last proceeded so far as to require the Secretary to the Council to attend as evidence in the Supreme Court; and not only himself, but the members of the Council were threatened with actions for not producing papers containing the most secret transactions of Government.

The Natives of the Province of Bahar drew up a petition to the Governor and Council, praying for protection against the process of the Supreme Court, or if that could not be granted, for leave to relinquish their arms, that they might retire to another country.

Paltry Attornies, promulgating the authority of the A. D. 1773. Supreme Court, spread themselves over the country, encouraging the Native spirit of litigation, and acting under the sanction of the King's Judges, proceeded in several instances to execute processes against all ranks, at the suits of people of the lowest description ; and one Attorney at Patna proceeded by force to the house of the Phousdar of Dacca, against whom a process of arrest had been instituted by him, and breaking down the gate of his house, entered by force ; and in the affray which took place, the father of the Phousdar, was wounded by a sword, and the Phousdar himself dangerously wounded by a pistol shot from the Attorney. This violent proceeding was justified by the Supreme Court : and innumerable instances of violence supported by Law took place.

Mr. Rons was at this time Advocate General of the East India Company—a man of superior character and wisdom—and fortunately in this crisis of affairs was at hand to afford his advice to the Supreme Council. At length the Governor General and Council came to the resolution of issuing a notification by the advice of Mr. Rons, to all Zemindars, Chaudharees, and Talukdars in the three Provinces, that, except in the two cases of being British servants, or bound by their own agreement, they were not to consider themselves as subject to the Supreme Court, or to obey its process ; and the provincial Chiefs were forbidden to lend a Military force to aid the Court in carrying its mandates into effect.

The Judges upon this appeared to lose all temper ; they imprisoned and confined Mr. Naylor, Attorney of the Company, and commenced a criminal prosecution against him. The Governor General and Council were indivi-

A. D. 1779. dually served with a summons from the Supreme Court, which, by the advice of Mr. Rons, and through him, they delivered their declaration that they would not submit to.

A petition against the Supreme Court drawn up by the European population. A petition to Parliament had been prepared and signed by the principal British inhabitants of Bengal against the exercise of the Supreme Court; and the Governor General and Supreme Council drew out another.

Colonel Pearse was, it will appear, a principal in the first petition, and the reader will therefore excuse this long digression.

The following letter written to Colonel Pearse's uncle, Admiral Mann, explains the circumstances which connected him with the petition to Parliament against the Supreme Court.—

To Admiral Mann.

“ Fort William, 4th April, 1779.

“ MY DEAR FRIEND,

“ When I wrote the P. S. to my letter of the 7th February, I did not know that I should find it necessary to be more particular; but now I perceive I am in danger, and must beg your aid and support.”

“ The situation of this settlement is, and has been these four years, most deplorable. Party spirit tore us in such a manner that all trust and confidence was at an end. On the one hand, Clavering and his party threatened every one with ruin and dismission; on the other, the Court of Justice excited the Natives to persecution of individuals, and disrespect to the Government and the Europeans in general. The people, accustomed for two thousand years to a most perfectly despotic Government, were at once to be put under the Laws and Courts

of the people who boast they are the most free of any on A. D. 1778. earth : licentiousness of course must be introduced instead of liberty. But though this consequence was inevitable — though the Europeans saw the conquered people treating them with the utmost disregard, considering themselves as the superiors, and persecuting their conquerors for the acts committed in the act of conquering ; yet, because the Supreme Court served to check the fury of the Clavering faction, we acquiesced under the tyranny of the Court, and made use of that engine to keep off the other. The Court therefore, though the most dangerous evil of the two, was accounted our preserver, and as you may have seen, a petition to the Judges was presented in which they are held forth as the saviours of Bengal. 'Tis true the number of believers was but small ; and that the whole was the mere act of the party which supported Mr. Hastings, is most certain. The Court encouraged by the reception, and ever aiming at power, has gradually extended its authority over all persons and places. The public have suffered the greatest losses by it, the wheels of Government have been clogged, the revenues diminished, and the people have grown insolent ; but these, except the last, were matters of small consideration to the body of inhabitants, nor could any thing have made them pay attention to them but personal wrongs and injuries ; these alarmed their fears ; and it is an effect of fear to make a man open his eyes, ears, and mouth."

" It is not necessary for me here to enter upon the particular circumstances which first drew the attention of the body of the people ; it will be sufficient to say that something did happen, and that in an instant all united as against a common enemy."

A. D. 1773. "Ever since Europeans came to India until the introduction of this Court, it was the custom for them to exercise over their immediate servants the power of inflicting slight punishments to compel the people they employed to do the duty they were set about; they found it the custom of the country, and necessity and example made them adopt it; no man ever thought it wrong till the introduction of the Court; but a set of men, bred up in the prejudices of our Courts, were, in an advanced age, lifted out of the middle of London into the midst of a set of people who, having conquered a mighty Kingdom and being very few in number, were under the necessity of adopting many of the manners and customs of those they had conquered. The clamours raised against the whole body, for the actions of a few individuals, had been used to support the party that wanted to partake of those riches which they saw with envy in the hands of the Company's servants. The minds of the lawyers were inflamed by the general uproar, and their prejudices were put into motion. They had hardly set foot on shore before they began to talk of the custom before mentioned, and to suggest to the people that they were sent to protect them against the Europeans, and that a remedy might be had at law for those who suffered corporal punishment from the hand of their employers. Several servants whose masters had given them slight boxes on the ear, ran to complain; their masters were summoned and frightened into compromise. But the alarm this occasioned amongst us, was so great, that these lawyers soon learnt it was necessary to temporize, and at last they owned it was necessary we should have the power, and that they themselves should use it, as we did. Nevertheless the starving dependants of the Court

did from time to time instigate the Natives to institute A.D. 1778. suits, and undertook the causes, to share the damages. At length it happened that a suit was instituted against a man who was determined to defend it; but the glaring partiality of the Court to the Natives in all cases where Europeans were concerned (which you may readily suppose when you consider that the lawyers wished to persuade the Natives they were their protectors,) determined him to demand a jury. This, which is the birthright of every British subject, was refused; it was declared that the King had given to the Court the right of jurymen; they were to judge of the fact according to what was right and to decree the punishment; that they had no right to grant juries in any civil suits or pleas; that they were restrained by their charter from granting them; that the act of Parliament was not passed to protect the British subjects, but to protect the Natives against the British subjects; that Magna Charta did not extend to India, and those who were so fond of it must enjoy it in England."

"I hardly need to tell that the consequence was general dismay; the words passed like fire through the settlement, and every creature found he was attacked, and stripped of his birthright-privileges; all now united as against a dragon who would devour them. Some who had time and abilities for the task, returned and drew up a petition to the Court, claiming the right to Juries; but knowing the probable answer, from the declaration before mentioned, they prepared also a petition to Parliament, praying for the right, and for the redress of many other grievances which this Court had introduced. I give you my word of honor I was not one who helped to draw it up, but I own I wish I had been. After they

A. D. 1778. were drawn up, I was told of it by a friend, and that a meeting would be held at the playhouse to read the petitions and to sign them. I went, heard the petitions, and most cheerfully signed both."

"Afterwards the subscribers chose a committee to keep the petitions, and to get them signed, and to forward the business; the number chosen was twelve; and it pleased the gentlemen assembled to make me one of the members."

"When the petition to the Court was ready we carried it up, and on the day fixed on, the committee went for their answer. Judge of our astonishment, when, to the refusal we expected, we found insult and contempt added, and heard, in illiberal language, a false charge brought against us. It was said, that before the petition to Parliament was shewn to the subscribers, promises had been exacted to subscribe. It had been resolved that the petition to Parliament should be kept by the committee, and signed before them, that no copies of it might be taken. The corps I commanded was at Dum Dum, eight miles from town; and as my officers wished to see it, but could not go to town, I carried it to them; and one field morning after breakfast, (for you are to understand all the officers were accustomed to breakfast at my tents after every field day,) I read it to them. When I had so done, I told them, if they conceived it to be a matter which concerned them as British subjects, they of course would sign it; if they did not, they were requested not to mention the contents."

"I was on my guard not to say any thing that could act to determine them to sign, as in compliance with my wish or will, well knowing whom I had to deal with.

My whole corps signed, and I carried it back to town A. D. 1778. at night. When, therefore, the Judges charged us with exacting promises to sign, as I knew it was an absolute falsehood with respect to myself, I replied, that I could answer for myself that I had not done it, and for the officers of the corps I commanded, a long list of whose names was annexed to the petition, that they had not made any promise, that when I read the petition to them, I told them what I before mentioned."

"Thus you have had a full and true account of what I did; but it seems the Chief Justice, whose pride is only to be equalled by his heat of temper, is so much offended with me that he is to write home to have me dismissed from the service. I dare suppose he will attempt it, and therefore furnish you with this narrative, which, as to the fact, I will swear to, though not to all the words spoken by others."

"I have told you that the alarm spread in an instant. There was afterwards another of a different kind, from which a presage may be formed of the future. The Mahommedans carry the representations of the tombs of two saints, named Hassan and Hosein, in procession in the month of Mohurram: this year that month fell in our January. On the two last days the processions march; and on the last of all, about noon, they carry the supposed saints, and bury them. This, which is the most solemn act of the Shii Mahommedan religion, is attended with wailings, and cries of Ya Hosein! Ya Hassan! and accompanied with drums, trumpets, and other instruments; and at this time it is almost sacrilege to come near them."

"A procession of this kind, (it was the last and the most magnificent,) stopped in front of the Court house.

A. D. 1778. The noise disturbed the Judges, and they sent the Deputy Sheriff with his white wand to drive them away. As he was not able to accomplish it, he imprudently struck one of them with his wand; instantly the enraged multitude assailed the Court house. Bricks, and whatever came to hand they threw at it, but happily for us, they did not kill any body; a Military force was sent for, and the procession dispersed."

"This shewed the protectors of the poor oppressed Natives, that they held their protectors in the utmost detestation; but shewed the rest of the Europeans, that the respect the Natives used to hold them in, was gone. And as we know that the Mahommedans believe that those who die fighting for their religion do instantly go to paradise, that they are bound by the commands of God to keep the Mohurum and the Shii, to celebrate the death of these saints; so we know that enthusiasm will make them determine to maintain the right of the British subjects, (an idea given them by our Court) to celebrate their religion in the manner of their forefathers. And as they have been taught that those who are struck may strike again, and after all prosecute those who struck them first, so we may conclude that this will be the foundation of future disturbances, which, beginning with Ya Hosein! may end in the thunder of cannon or the groans of murdered Europeans."

"To conclude, this first instance of a spirit of resistance and contempt of Europeans, shewed the inhabitants what they may expect hereafter, when the spirit of equality shall be more diffused. We do seriously and sincerely believe there will be much blood shed, in consequence of the interruption to religious ceremonies, whenever that shall happen; and we know that the

Portuguese lost India for only attempting to pull down A.D. 1779. an idol. And I know that a common Fakeer of reputed sanctity might very easily instigate the Mahommedans to rise to a war; enthusiasm is not yet quite dead—that is a serpent that will never die.”

“I have related facts; I have not exaggerated. I have not spoken of any points but those which mark plain facts; but I do declare that this tumult could not have happened if this Court had never been instituted; and it is my opinion that either this Court must withdraw, or that these provinces must be lost: for the Europeans will either be massacred, or driven out in a very few years, if the Court continues here.”

“Assist to save the settlement and

Your friend and kinsman,

T. D. P.”

In another letter to General Pattison, Colonel Pearse writes:—

“What has become of America, is not certain; but from all accounts we have, we conclude, it is severed from the British empire, and we lament it seriously; many of us wished to have ended our days there, had it retained the same form of Government.”

“The Supreme Court was established in 1774; and we are all now in a state here which is most disagreeable. The prospect of relief keeps us alive. A petition has been sent to Parliament signed by 550 inhabitants of this settlement, and more will yet sign, though there are not above 800 Europeans in the place exclusive of private soldiers, seamen, and lawyers.”

Early in 1779, another large detachment of Artillery was ordered to march under Major Camac with two

Another detachment of Artillery

A. D. 1779. battalions to join the Army under Lieut. Colonel
 marches to Goddard; and Colonel Pearse mentions the train with
 join the Ar- my under that Army as the largest, and on the most important
 Lieut. Col. service, that ever marched in India. The detachment,
 Goddard. however, did not march until June, as the following
 general order vouches—

General Order by the Commander in Chief.

“The general order, dated the 14th May, specifying that Major Camac, and the detachment under his command is to proceed to Berhampore, and the presidency is revoked. Major Camac is ordered with the whole detachment to march to Dinapore, there to remain until further orders.”

“The guns, stores, &c. belonging to the detachment are to remain in the magazine at Patna. On the arrival of the detachment at Dinapore; the 35th Battalion of sepoy commanded by Captain Moses Crawford is ordered to march from thence and take post at Paggah for the protection of that district.”

Arrival of
 Sir Eyre
 Coote.

In March 1779, Lieut. General Sir E. Coote, K. B. arrived from England with the commission of Commander in Chief. From representations, grounded on error, blind infatuation, and party views, alarm had been taken by the Court of Directors and by the Government, that it was dangerous to teach the Natives the use of Artillery.

Sir E. Coote
 brought a-
 bout the
 reduction of
 the Golun-
 dauze.

The corps of Golundauze, which had so faithfully served the Government, was ordered to be disbanded, the men having the option of enlisting as Sepoys or Lascars. To entertain as Sepoys, the Golundauze were very unwilling; and as Lascars, they considered themselves degraded; not only from the duties the latter had to perform, but also from being placed upon inferior pay. The consequence

was, that many Golundauze deserted; others refused to entertain in any corps, and requested to go to their homes; and these men, in many subsequent actions with the enemy, were found filling their ranks and serving the enemy's Artillery with undaunted bravery, steadiness, and effect.

Soon after General Sir Eyre Coote's arrival, it was rumoured about Calcutta that Sir Eyre Coote had brought authority to disband the Golundauze; and as this was a favorite corps of Colonel Pearse's, and deservedly so, because he had not only formed it, but brought it into a fine state of discipline, it may be supposed that he readily took the alarm, and endeavoured to prevent its being reduced.

Colonel Pearse had unfortunately many enemies in high rank in Calcutta. Mr. Francis's and General Clavering's faction, and Mr. Hastings's adherents kept up all those feelings of rancour which had been so long disturbing the peace of the settlement.

One of the chief opposers of Colonel Pearse was Colonel Watson, commanding the Engineers; and as he had vowed the overthrow of the Golundauze, and had considerable influence, he urged Sir Eyre Coote to proceed in this unfortunate measure.

Colonel Pearse, however, determined that this injustice to these faithful servants should not take place, if he could prevent it; he therefore exerted himself as became him in the situation which he held. Those readers who may recollect the Golundauze at Cawnpore, under the late Major Hay, may well conceive how deeply it must have wounded Colonel Pearse to see a similar corps sacrificed to jealousy and party views; and there is every reason to suppose that Colonel Pearse's Golundauze were equal to Major Hay's, which is saying every thing, for there never was a corps better disciplined.

A. D. 1779. The true secret of the hue and cry against the Golundauze, and the cause of their first downfall, it is now believed, is pretty fairly stated in the following letter from Colonel Pearse to General Sir Eyre Coote.

The letter also affords a proof of the superior discernment of this distinguished Officer, in the remarks about the effect of Artillery in Brigades* instead of pairs of guns, the superior effect of the fire of which has been so decidedly proved of late in Europe; and this distribution of Artillery has at length been established in India by our present illustrious Commander in Chief.

*To Lieut. General Sir Eyre Coote, K. B. Commander
in Chief.*

SIR,

First letter
to Sir Eyre
Coote on the
subject of
the Golun-
dauze.

"It seems impossible to furnish European Artillery enough for the services of this establishment, because we are liable to be attacked at the two extremities, and they are at such a distance as to render it impossible to afford speedy assistance. For this reason it appears the more necessary to establish Native Artillery. I am entirely of opinion that it would be better not to teach the Natives the art of Artillery, and so it would to have kept them ignorant of the whole art of war; but the impossibility of doing either is evident, since the desertion of a few Artillery soldiers, if skilful in their profession, would have been sufficient to render all precaution useless; and the fact is that Sujah ul Dowlah had Golundauze who could fire salutes with one gun, and they did it: how far they were masters of the other part of the art, I cannot say. That the Natives are capable of learning the

* Two Guns have lately been called a Brigade; but by the term, as here used, a number of Guns is implied.

whole, I myself do not doubt; I know they may be A. D. 1779. taught any thing if the person who undertakes to instruct, will only take pains to explain his own meaning thoroughly, and with temper; and I think it would therefore be much to the detriment of our service not to make use of the men we have."

"Although the name Golundauze is new, there have been Native Artillery in the service these ten years: for every battalion since 1770 had 2 guns attached to it, for which they set apart 30 sepoys, who were taught the exercises. Therefore whatever mischief may be apprehended from having Native Artillery, we were then liable to, though we could not then derive all the advantages we now may. By collecting and giving them officers, the discipline becomes uniform; and when guns are detached for service, officers can be afforded. It was to very little purpose that two guns were fixed to battalions; they served to ornament the flank on field days; but I believe very little real service was to be expected from them. They had not any Artillery officers, and yet guns in the field require the most skill to manage them; but unless the officers are regularly trained to it, there are many points that will not be acquired. To point a gun is so easy, that any man may learn it in a minute; but to manage the gun so as to produce the best effect, several things must be attended to: the nature of the ground, the distances, and the charges. To perform this, two Artillery soldiers were detached; very few of them understood these things: in fact they are not taught it to the degree necessary for them to be left to themselves; this is the duty of the officers and non-commissioned officers, though some privates do know it also from practice and observation. By being their own masters, though they

A. D. 1779. went out good men, they returned drunken vagabonds; and this I can affirm to be a fact, and so very few were the exceptions, that I may say it was general. With the two Europeans some Lascars were sent; they, though they were of the Artillery, were only employed to drag the guns; they were unarmed and undisciplined; but they served for many menial offices, which made them desirable to the Captains of the battalions. Every battalion which had these guns, though nominally seven hundred Infantry, was only six hundred and seventy Infantry and 30 Artillery; for so many men they generally set apart for the guns. Now every Battalion acts with its whole force, and every gun detached may be of service. The men will be under their own officers; their discipline will not much suffer; and if it does, by returning to the corps it will be restored, which I think could not be the case before. But I must beg leave to give an opinion against Battalion guns; cannon in small brigades, brought to the points necessary, will do infinitely more service than when scattered along the whole line. This was found by experience the best mode last war, and in the latter campaigns was generally practised. Each of these had an officer whose superior rank gave him superior advantages; the cannon were better looked after, and in action produced most effect; and I imagine this must ever hold good in all services."

"With respect to the Native Artillery it is to be observed, that, if by any means they lose their cannon, being armed and disciplined, they may instantly become Infantry; whereas by being unarmed as the Artillery Lascars were, they became a mob as soon as they lost their cannon. Those I have trained, perform all the duties the Lascars were wont to perform, I mean the Artillery

Lasçars: they make the stores and manage the park; it A.D. 1779. is true their duties are the more laborious, and it might therefore be worthy of consideration, whether they ought not to have a small addition to their pay; were they only allowed half a Rupee a month more, there would not be any fear of desertion; we should be sure of being always complete and always ready for action."

"These observations I thought it my duty to make to shew that, since we cannot have Europeans enough for all purposes, the Natives may be used to advantage. In regard to a possibility of desertion, and teaching the Country powers, I have said we were before as liable to it, or more so, than we shall be if some small addition to the pay be made; but granting they desert as the sepoy do, we have not much to apprehend. Though the Country powers have Infantry formed like ours, they are inferior in every respect; their irregularity of pay is the grand foundation of it; their want of sufficient instruction, and of the essential knowledge of our discipline will long keep them so; and such as their sepoy are to ours, their Artillery will be to our Artillery, though the men should desert in the same proportion, which I do not think would happen. For these reasons, I hope the Native Artillery will be found worthy of keeping up; and the mode of detaching guns, wherever they are wanted, preferred to attaching them to battalions; and I further hope that the specimen of what may be done in a little time, will be considered as an argument for continuing what has been begun, and so happily meet with your approbation."

On the receipt of the order to disband the Golundauze, Col. Pearse
Colonel Pearse again attempted, without success, to pre-endeavours
vent this ill-judged measure from taking effect, by a the reducti-

A. D. 1779. respectful representation to the Government, a copy of which he forwarded with the following letter to General Sir Eyre Coote.

on by writing again to Sir Eyre Coote, and to Government.

To Lieut. General Sir Eyre Coote, Commander in Chief.

"Fort William, 24th Nov. 1779.

"SIR,

"I should not have presumed to renew my address to you on the subject of the Golundauze corps, did not necessity oblige me to it. Rumours of a particular nature which, if they have any foundation, are better known to you than to me, make it fit that I should trouble you."

"Your orders arrived when I was at Ghyrettee. Yesterday they were published, and I was about to carry them into immediate execution, as I am in all duty bound to do, and shall ever consider it as my greatest honor to act conformably to your pleasure, by the most punctual obedience. But when I considered the reports of wars and attacks, which perhaps have no foundation, but as I cannot know that for certain, it behoved me to act as if they were real. I therefore, as you were at so great a distance that an answer could not reach me in less than a month, took a step which will I hope meet with your approbation, the only one by which I could save myself from blame, should the reports have any ground."

"I therefore addressed to the board a letter of which I have the honor to enclose a copy, and at the same time send it to you."

"As my only intention was to be authorized to postpone the execution till I could consult you, I submit what I said to the Board to your consideration, and humbly hope to obtain the honor of an answer, which will extricate me from my present difficulties."

"As your order does not mention any Native officers, A.D. 1779. I beg to know how they are to be disposed of. They are men who have served many years, and therefore I presume it is your intention to divide them also amongst the sepoy; but the total silence concerning them leaves me in doubt whether they are to be so disposed of or reduced."

"When the order is carried into execution, may I presume to submit to you the propriety of doing it by draughts at once; they will in that case I believe not hesitate which to choose; at present I know there is a difficulty: they all know that a Golundauze is, in the Country service, the most honorable distinction. They know the Artillery have in our own, higher pay, and they consider this as putting the Artillery on the same footing in our service."

"The means which I take the liberty to point out, will most effectually get rid of the present corps, without a probability of diffusing that knowledge which we wish to confine, as much as the nature of things permits, to ourselves; but disbanding them will, I presume, promote it: for as they are now all well disciplined, when they shall find themselves destitute, they will naturally make use of all their knowledge for their own necessities, and seek for bread where they can get it, on terms more to their advantage than by the choice that is given to them by your orders."

"In the mean time, that I may shew my readiness to obey your orders, I have desired the officers to advise them to go to the sepoy corps; and on Monday next, which is review day, I shall do the same thing publicly. I have desired Captain Clerk to attend; and from that day he will use his endeavours to get as many as he can.

A. D. 1779. If any difficulty arises, it must proceed from the cause I have mentioned; and in a country where every man sticks so firmly to caste, which is only name, it is a very powerful one. It was by that and that only they were brought forward to what they are; for in all respects they perform the duties of Lascars; but I do know that they will not become Lascars, and that the ignominy of the name amongst themselves, and the consequent shame of descending from the highest to the lowest rank, and the difference of pay prevents it. It was finding that I could not get any, but the men unfit for sepoys, that I recommended the changing the names, giving them arms, and increasing the pay. It will not then be a matter for wonder that they will not again become Lascars."

"I do not mention this as any objection to the intended change; far from it: it is your pleasure that it be made, and I shall endeavour to the utmost to get the best I can and to use them to the most advantage, but I thought it necessary to explain why the late change was made. Many of the Golundauze will, I suppose, become sepoys; for they will see they have less to do, and the same pay; as the name is honorable also, they will have every reason to change, and in fact will be better off. Incorporating them at once will, therefore, be effectual in every respect, and for that reason I presumed to recommend it. The orders I may receive from the Board will determine me how to act for the instant, and your further orders will be my guide in future."

"I am, &c. &c.

T. D. P.

Lieut. Col. Commandant of Artillery."

To the Honorable Warren Hastings, Esq. Governor General, and the Supreme Council.

A. D. 1779.

" Fort William, 28th Nov. 1779.

" HONORABLE SIR AND SIRS,

" As the Commander in Chief is at a great distance, and it is impossible for me to be honored with his commands in less than a month, I take the liberty of addressing you on the present occasion."

" The Commander in Chief has been pleased to send the order of which the enclosed is a copy, which was yesterday issued and must be carried into execution immediately, unless you should be pleased to authorize the suspending it, until the Commander in Chief can be consulted on the occasion."

" The Artillery now consist of 370 in all, of whom only 150 are at the presidency. Two ships have arrived and not brought a single recruit; consequently the possibility of completing the Artillery is not to be expected, and cannot happen till next year. If we consider that his Majesty's armies are now recruited by pressing, it is not to be even hoped that we shall gain many next season. Were any sudden attacks to be made on us, I can assure you the Europeans we have are very much too few for the duties of the defence of this place: yet, would it be necessary to send out detachments, and, consequently, to reduce the present number?"

" That most of the Golundauze are now good Artillery soldiers, I affirm from my own certain knowledge; and as the name is in Hindoostan the highest amongst the soldiers, none of them I believe would enter as Lascars, even if the pay were equal; but the difference is so considerably against the Lascars, that that alone would be sufficient to determine the Golundauze to quit

A. D. 1779. us. Therefore, though the last new regulations have allowed us Lascars, the men we have enlisted will go away, and those we are to entertain, will be raw and ignorant, and must be instructed; consequently, for a time we shall be almost destitute of Artillery."

"I submit it therefore to your consideration, whether it may not be proper to keep whatever we have, till you can consult the Commander in Chief on the subject. My duty to myself makes this address necessary, lest if any ill consequence should follow the immediate execution of this order, it should be supposed I had neglected my duty to the service by being silent on the occasion."

"I therefore beg to be honored with your commands."

"I am, &c. &c.

T. D. P.

Lieut. Col. Commandant of Artillery."

Colonel Pearse's endeavours, however, were looked upon by Sir Eyre Coote as arising from a spirit of insubordination, which never had a place in Colonel Pearse's breast; and the following letter from Sir Eyre Coote at once silenced all remonstrances—

To Lieut. Colonel Pearse, Commandant of Artillery.

Chunar, December 5th, 1779.

"SIR,

Harsh letter
of Sir Eyre
Coote to
Col. Pearse.

"I am not more surprised than hurt to find you endeavouring to sap to its foundation that subordination and obedience which every officer ought to feel as so essentially necessary to his profession. I can say no less of your letter to me of the 24th ultimo, enclosing a copy of one addressed by you to the Board."

"The orders issued by me, relative to the reduction of A. D. 1779. the Golundauze corps, were clear and explicit, and required from you an exact and immediate compliance, instead of delay and remonstrance; and they were authorized by that very Board which you have applied to, to lay them aside."

"Your urging any plea as an excuse for hesitating to obey them, is both unmilitary and unprecedented. You are not called upon for your opinion, nor are you answerable for any consequences; obedience was the only thing required, and I now demand it from you in the strictest sense of the word."

"I am, &c. &c.

(Signed) EYRE COOTE."

The circumstance of Col. Pearse sending an address to the Board, on the subject of an order sent by the Commander in Chief, requires some explanation here, in justice to Colonel Pearse's character.

During the command of General Stibbert, several important Military transactions occurred; and General Stibbert being occasionally in the field, and at some distance from the presidency, Colonel Pearse found it necessary to obtain permission from him, as Commander in Chief, to address the Board or Government direct, on urgent occasions, which required immediate attention. Acting in the spirit of this permission, and considering the measure of disbanding the Golundauze as fraught with danger, Colonel Pearse conceived he was acting in the line of his duty by making a most respectful representation of the circumstances to the Governor.

The following explanatory letter from Colonel Pearse was written in reply to the Commander in Chief—

A. D. 1779. *To Lieut. General Sir Eyre Coote, Commander in Chief.*

"SIR,

Explanatory
letter
from Col.
Pearse.

"I was yesterday honored with your letter dated Chunar, 5th December, by which I but too plainly perceive that I have offended you, and that my offence is deemed of so heinous a nature as to be unmilitary and unprecedented; and that you entertain an opinion of me, that I endeavour to sap to its foundation that subordination and obedience which every officer ought to feel as so essentially necessary to his profession."

"This letter has filled me with most uneasy apprehensions: for conscious as I am that in what I did I meant to act for the best, and not having had the faintest idea of the possibility of my offending the Commander in Chief, whose approbation I above all things wished to obtain, which I can safely say the high sense I have of his authority ever made me most desirous to shew, I cannot but be deeply affected at finding that I have fallen under his displeasure."

"With respect to the step which I thought it necessary to take, give me leave to assure you, that I should have judged it highly improper in any case but that of necessity; and that I had at least the appearance of necessity, I hope you will be pleased to admit, after you shall have read the following statement."

"Reports prevailed in the settlement that a body of Mahrattas were about to invade the Provinces, and were then on the borders of Burdwan; these were so confidently spoken of, that I actually and most firmly believed them. Whether it was true or false, was a question I could not presume to ask from those who alone possessed the information. I knew, however, that the services of the corps I command, would be much wanted, and indispen-

sably necessary; and that the whole of the Europeans, A. D. 1779. sick and well, was 150, which, as I represented, would be insufficient without assistance; the assistance which we had at hand, the executing of your orders would have deprived us of. And I apprehended that time would be wanted to raise the Lascars, and that, if the Mahrattas should really be coming forwards, it would be very difficult to raise them at all: the case became so very intricate that I knew not how to act. I thought it not improbable but that you might be unacquainted with it; for the news might have come by a different route; that you could not have known of the arrival of the two ships without bringing us a man, when your orders were dated, was, I thought, certain; so that I concluded it would have met with your approbation that I should take measures to delay the execution of your orders till those circumstances could be made known to you. But, Sir, an officer in this service has not been trusted with that kind of discretionary power which in some cases becomes necessary; and therefore I did not dare delay the execution of your orders by my own authority. I could not receive my orders from yourself; for I only wanted time to obtain them. The fact of the ships I knew; but, as I before said, I could not presume to ask concerning the reports; therefore it appears to me that it was my duty to you and to the service, to state facts concerning the state of my corps to the Council, who, being informed of them, could at once determine whether the orders might with safety be instantly carried into execution, or whether it would be more proper to defer it until you could be consulted. This, Sir, was the reasoning which passed in my mind on the subject, and in consequence I wrote that letter which now unhappily has drawn down

A. D. 1779. your displeasure upon me. I was apprehensive of it at the time, and to prevent it, if possible, I sent a copy to yourself with a letter on the subject; and I flattered myself that by so doing I should remove all cause of complaint against me on the article of want of respect or obedience: nay, I ever hoped for your approbation of my conduct, and am persuaded that if the reports had turned out true, you would have commended me. Happily for the Company, they proved erroneous: but alas! I find myself in a very bad predicament, and have offended that Officer whose favorable opinion I most coveted, and emulously strove to obtain. With respect to my letter on the subject to yourself I hope no unguarded expression has crept in to give offence. If any such there be, permit me to assure you that I did not intend to write a word in my letter, which should carry a meaning contrary to that profound respect which is due to yourself and the high office you hold in this Army; and I pray you, that, if a harsh or improper expression is to be met with, you will favor me so far as to explain its meaning by this assurance."

"Since, Sir, I have most unhappily fallen under your displeasure by the step I took, let me beg you will be pleased to consider it as founded on error in judgment, and not in want of obedience; permit me to assure you that in the course of 22 years service I have ever studied, not only thoroughly in what subordination and obedience consist, but how best to practise them. A case of a most intricate nature having occurred, I to my shame and confusion find I have acted in a manner which my present Commander in Chief deems unmilitary in the highest degree. To him I now address myself to intreat him to overlook the error in my conduct, and to

entertain a more favorable opinion of me than that which A. D. 1779. is expressed in the letter I was honored with."

"I am, &c. &c."

In the mean time, the final resolutions of Government appeared in the following Minute of Council, which was issued—

Extract of Minutes of Council.

23rd November, 1779.

"Ordered that the Native officers of the Golundauze Minute of Council ordering the corps to be disbanded. corps at the presidency be paid up to the end of this month, and immediately discharged from the service; that the Commandant of the Artillery be directed to repeat the offers already given to the men, and those who still decline to accept of them be immediately disbanded."

To General Desaguliers.

"6th May, 1779.

"DEAR GENERAL,

"You must have heard a good deal at home about our squabbles in the East."

"For these last four years we have been torn by The unfortunate dis- parties, more violently than any part of his Majesty's sentions in subjects. The clashing of our interests, the difference of Calcutta our views, and the rancour of our chiefs had set us so subside, much against each other that I thought it impossible we and the whole En- could ever be brought to unanimity; however, our Court ropean po- has effected it." unite to petition against the Supreme Court.

"We are not above a thousand in Bengal; yet you will see near 600 names signed to a petition to Parliament for redress of grievances. The distance of our various settlements in Bengal has prevented many names being

A. D. 1779. added; the Supreme Council, and the dependants on the Court, and some few, who find their interest in it, are the only persons who have not signed, or will not do it."

"The people here who had been for ages ruled by despotism, were all at once told that they were free, and that they could bring an action in a Court of Law against any European from whom they thought they had received even a supposed grievance. An individual who was brought before the Bench on the complaint of a Native, demanded a jury. The bench refused it, and the lawyers refused to plead his case; he was forced to plead for himself. The Judges declared that we had no right to juries here; the whole settlement took the alarm, and in an instant re-united, and drew up a petition to the Judges, presenting it with every mark of respect that could be desired."

"The petition was also drawn up for Parliament, setting forth in a plain manner the grievances; the principal of which was, that trial by jury was not allowed, and that individuals were daily subjected to suits brought against them for actions committed many years before, which were not contrary to the Native, but to the British *ex post facto* laws. Natives are made equally subject to the Bench; and from what I can learn from discoursing with individuals amongst them, they look upon the circumstances with dread, and only submit to them for fear of our power."

[To be continued.]

ARTICLE II.

Observations on the precautions necessary to prevent the infection of the Cholera amongst large bodies of troops, while marching through districts where that disease is raging.

To the Editor of the Military Repository.

SIR,

ALTHOUGH much has been written on the treatment of the Cholera, I do not recollect having met with any observations on the preventive measures to be adopted, towards averting its introduction amongst large bodies of troops, who may be moving through districts where it has been committing ravages. It appears from numerous facts, a few of which I shall proceed to detail, that much may be done in a country, so thinly peopled as India, to ward off contagion from the troops, both on a march, and in fixed cantonments. This is highly important in a military point of view, independent of the general interest comprehended in every attempt to eradicate this fatal disease.

The first fact I shall state is that of two Native corps, both of which left Hyderabad about a twelve-month ago, for the northern division, and which moved over precisely the same ground for the greatest part of the route. In the former of these, the Cholera committed most extensive ravages, and swept off a considerable number of sepoys, doing also, as usual, infinitely more mischief amongst the families and followers. It does not appear that this arose from the slightest mismanagement, nor is it my wish to hint the least degree of blame

Remarks on the

as attaching to any one. But it is certainly of importance to be known, that in the latter of these corps, the 1st battalion 21st Regiment, not a single sepoy died of Cholera, during the march from Hyderabad to Samulcottah, and very few cases occurred amongst the followers. Under providence, the good fortune which attended the latter corps, may be attributed to the mode adopted by the Commanding officer, of invariably selecting the highest spot of ground in the neighbourhood of the different villages where he encamped ; endeavouring, if possible, to pitch to windward of them, and avoiding, on every occasion, taking ground which troops, or parties of any description appeared recently to have occupied, without regard to the increased distance from bazaars, or water. The only spot, during the entire march of this corps, at which Cholera exhibited itself, was in a narrow valley between two hills, where the camp was exposed, during the night, to a current of cold damp air, attended with rain. This was a position that could not be avoided, from the face of the surrounding country. I state these particulars from memory, as they were detailed to me by an intelligent officer of the corps, and I am not aware that I have at all differed from his narrative.

The next fact is that of the flank battalion, composed entirely of Europeans, which moved from the Doab to different stations in the Company's provinces, distant from each other, and passed over a large tract of country, without a single case of Cholera. The usual mode pursued by this battalion appears to have been, to encamp on high dry ground, rather at a distance, than in the vicinity of villages—to avoid invariably those places where the marks of former encampments were discernable

—to make short marches every successive day, but without halting any where. It may be worthy of consideration whether the two facts which I stated, and numerous others that might doubtless be collected, do not authorize a deviation from the ordinary principles of castrametation, until India is free from this singular and awful visitation.

Some of the principal points of precaution to be attended to, I will briefly enumerate, as they have struck me in cursorily reviewing the subject.

First, On all occasions to select high dry ground where no marks of a previous encampment are discernable; and always to windward; and if possible, at some distance from the nearest village, instead of encamping immediately contiguous to it.

Secondly, To make short marches daily without halt: so regulated, that the troops may move about daylight, and reach the new encampment before the sun becomes powerful, whereby the danger also of fatigue, as an exciting cause of the disease, would be avoided.

Thirdly, To avoid, as far as may be practicable, the more populous places on the route, and to select such as may be thinly inhabited in preference; also to endeavour to prevent, as far as can be done, any intercourse between the troops and the inhabitants of the country through which they pass. The communication with bazaars is, of course, unavoidable; but strolling about villages, and going into the huts of the Natives, should be prohibited.

In addition to these few plain rules, it might be advisable to recommend the sepoys to abstain, in these times, from eating in the morning cold fermented rice which has been boiled over night, and to substitute for it thick conjee, warmed with a chilly or two. Of course

no arbitrary measure could be used, and the above substitute can only be recommended through the Native officers: from which measures it seems probable, that the habit so universally prevalent amongst Natives, of eating cold rice of the above description in the raw air of the morning, preparatory to a march, might be overcome, and the pernicious effects likely to result from it be avoided.

When troops are under the necessity of making short movements, which may be completed within 22 days, and with no orders for particular expedition, it might be highly desirable for them to commence their march at the beginning of the quarter, succeeding the new or full moon, so that one unhealthy quarter might thereby be avoided: that is, if the planetary influence should have greater effect on bodies exposed to fatigue, and to sudden vicissitudes of heat and cold, inseparable from such movements.

Sentries, and all men, exposed to the influence of the night air, should be ordered to wear their boat-cloaks invariably from sun-set to sun-rise.

The kannauts of the sepoys' tents, should be well fixed down to the ground every evening about sun-set, to avoid exposure to damp, cold air.

To conclude: In addition to the mass of evidence which has been already before the public, both in works of a professional nature, and in general opinion, tending to demonstrate the influence of infection in this disease, I shall point out the advantages which have resulted from the precautions taken by the officers commanding at Secunderabad and Bangalore, under a conviction, that the disorder was introduced and propagated by contagion.

No corps has been allowed to enter the cantonments of either station, until it was fully ascertained that they were entirely free from Cholera; and in cases where they had suffered from it during the march, not until all symptoms of this formidable disease had disappeared for several days. Till this fact was established, they have been encamped ten or fifteen miles from the station, and all intercourse with them prohibited. At Bangalore, particularly, where this system has long prevailed, the happiest effects have been produced by it: much may perhaps be allowed for the site of both these cantonments, as they are placed on fine rising ground, gently sloping towards both front and rear, and on a hard red soil, where the heaviest rain soon runs off. At Bangalore, I believe, the deaths have not amounted to twenty since the first introduction of the disease on the coast. Secunderabad has not escaped so well, though the mortality has been far less, in proportion, than at most other stations, and perhaps would not have exceeded that at Bangalore, but for the comparative disadvantage under which it labored, from being in the immediate vicinity of the populous capital of his Highness the Nizam, where great ravages were committed by it.

Should you think these observations, loosely thrown together, worthy of appearing in your intended publication, they are very much at your service.

I am,

Sir,

Your most obedient Servant,
A MADRAS OFFICER.

Madras,
4th August, 1821.

ARTICLE III.

Philosophical experiments upon the refraction of musket-balls in water, and upon the resistance of this fluid; by Mr. Carré, (11th July 1705,) translated by Mr. Chambers.

THERE being several persons who doubt whether musket-balls undergo any refraction, that is, any change in the direction of their motion when shot obliquely into the water; and I, having asserted it as a known fact, in the history of the Academy for the year 1702, upon the authority of several former writers, I desired a friend, who has been for some time at his country-house, to examine into the truth of it; and the following experiments are the result of this request.—

First,—I shot a musket-shot, loaded with a ball, once, and a second time, into a stone bason full of water, 2½ feet in diameter, and 16 inches deep: the first time under an angle of 20 degrees, and the second, under an angle of 80°; but I could not perceive whether the balls underwent any change of direction, by reason of the great effort of the water against the sides of the bason, which always displaced the piece of pasteboard which I had lodged there for a mark. This effort is so violent, that, upon shooting three times into tubs of water, they were all instantly burst; and in particular, it was always the lowest hoops that the water made give way.

To satisfy myself that it was really the great motion and effort of the water that burst the vessels, and not

the ball by passing through, I provided a square chest, about a foot high and half a foot thick, the four boards whereof, which formed the length, were each an inch thick, and the two at the end, each two inches thick, that the others might be well fastened thereto with strong nails; then, filling it with water by a little hole, I exploded my piece; upon which the ball perforated the boards very exactly, without bursting them, but the water was shook so violently, that it tore the boards from each other, and burst the chest.

Secondly,—To make a more precise experiment on the refraction of a ball in the water, I filled a stone bason therewith, whose length on the inside was three feet three inches, its breadth one foot eight inches, and depth one foot one inch, which is here represented by A B C D. To the side B D, I fastened a board to receive the balls; another board E F, precisely in the middle; and another C D, upon the bottom, to cover it entirely. The boards were all strongly fastened, that the strokes of the ball might not shake them. Over the side C A, I fitted a piece of pasteboard G A, perpendicular to the horizon, and the musket H N was fixed eight feet from the bason. Upon exploding it, the ball pierced the pasteboard in K, and was found flattened like a shilling at M. I shot a second time; and found the ball broke into three pieces, which were likewise flattened, without appearing to have struck against the board E F. I shot two balls with a stronger charge of powder; but they were neither of them to be found, either at the bottom of the bason, or in the boards. These balls were one third of an inch in diameter; and being made on purpose for the piece, filled it very exactly.

Thirdly,—To try anew the experiments of refraction, I bethought myself of a way to get an insight into this flattening of the balls. To this end, I procured a reservoir of ten feet square, and fitted therein two boards, parallel to the horizon and to each other, and about a foot apart, the upper one making the same plane with the surface of the water; then, shooting two balls upon this board under the angle of 30 degrees, and with an equal charge of powder; the first, with the piece used before, whose barrel was 3 feet $2\frac{1}{2}$ inches long, and the bullet $3\frac{1}{2}$ lines diameter; the second, with another piece, whose barrel was 3 feet 10 inches 3 lines, and the ball 7 lines in diameter. Here the large ball pierced the two boards, and consequently, traversed the whole extent of the water between them; whereas the small one only pierced the upper board, and was found quite flattened on the lower.

Fourthly,—But to satisfy myself whether there be really a refraction, I made use of the stone bason, described above, and prepared after the same manner. Then fastening my piece upon two rests, one of them five and the other seven feet distant from the bason, I nailed it down, so as to make it remain in the same situation after the explosion, as before. It now made an angle of 20 degrees with the horizon, or the surface of the water in the bason; and was charged with 3 pennyweights 20 grains of powder, and a ball 7 lines in diameter, weighing 17 pennyweights 6 grains. Shooting it off, the ball, after piercing the pasteboard in K, and the board EF in P, stuck in the point R, where I found it fast. Upon this, emptying the bason, I drew a thread from the middle of the ball in R, through the holes P

and K, to the middle of the mouth of the piece; and found that the thread passed exactly enough through the centres of all the holes.

I repeated the same experiments by setting the piece a little on one side, that the ball might pass through a fresh place. The effect was, that piercing the paste-board half an inch from K, and the board E F, half an inch from P, it fixed likewise half an inch from R: so that the centre of the two balls wanted not a line of being in the same parallelism to the horizon; hence it may be inferred that, if there be a refraction, it is not sensible.

Being willing to try whether the ball of 7 lines diameter would be flattened by increasing the charge of the piece, I used 7 pennyweights 6 grains of powder, and found accordingly the ball about M flattened on one side; it had struck the board E F slightly; but this could not have occasioned its flattening, since a ball will pierce 3 or 4 boards without losing much of its sphericity. Putting the same charge of powder in the former piece, I found the ball about M cloven into 2 parts, each of them flatted unequally, though without ever having touched the board E F. Shooting a second time, with half the charge of powder, the ball did not reach E F, nor lost any thing considerable of its sphericity.

Fifthly,—To procure further satisfaction as to the flattening of the balls, I spread a linen cloth parallel to the horizon, under two feet depth of water, in a bason 48 feet in diameter and 6 feet deep. Then charging my piece very high with powder, and loading it with a ball of 7 lines diameter, I discharged it against the linen and found the ball flatted thereon, though very unequally, and of an irregular figure. Then charging the piece

anew with one third more powder, the ball divided itself into several pieces, whereof I found 5 upon the linen, most of them about the bigness of a lentil, but differently shaped.

I then shot another ball perpendicular to the surface of the water, which was found flattened very regularly, being almost as round and flat as a shilling; whereas all those which had been shot obliquely, had flattened irregularly.

It may be proper to observe, that in shooting a ball into the water, it rises or rears itself above the same more or less, as the charge of powder is greater or less; and I have even seen it rise 20 feet high.

I will not be very difficult to assign the cause of these several effects, with regard to which I must observe, that 4 pennyweights of powder drive the large ball of 7 lines a considerable space in the water, without taking any thing from its sphericity; that with 8 pennyweights of powder it loses half its sphericity; and with 12, the whole; and lastly, with 16, breaks into several parts.

Reflections upon the experiments above.

There are two things to be considered in these experiments, which I can warrant to have been made with great care and exactness: the first, that the ball shot in an angle of 20 degrees changed nothing, at least as to sense of the direction of their motion; the second, that these balls, when exploded with a great charge of powder, turned flat as they entered the water.

First.—It should seem at first sight, agreeable to the common notion of the resistance of fluids, that a ball shot into the water under an angle of 20 degrees, or even a greater angle, should not only change its direc-

tion, but even rebound: for as the quantities of matter in all bodies are proportionable to their weight, and the resistance of fluids are in the same ratio as their densities, and the density or weight of water is to that of air, as 800 or 850 to 1, according to some experiments, or as 1175 to 1, according to those of the Academy Del Cimento, the water must make 800 times more resistance than air, and consequently diminish the velocity of the ball by the same quantity. Now it is easy to shew pursuantly to the reasoning of M. Descartes, and several others, that, if the ball upon meeting the water lose half its velocity, it must rebound.—For suppose a circle $E G D$, whose diameter $E F$ represents the separation of the surfaces of air and water, and suppose the angle $A C E$ to be 20 degrees, whose line will be $A B$, and $C B$ the line of its complement, the ball now being driven from A to C , we may consider its motion as composed of the vertical one $A B$, and the horizontal one $B C$, as $C B$ therefore is much greater than half of $C E$. If the ball lose half its velocity upon meeting the water, it should of consequence rebound; but experience shews us that it does not.

It must therefore be made to appear, that the ball loses so little of its vertical motion, that it not only should not rebound, but should not even lose any thing sensible of its former direction. In order hereto we are to observe, that it is when the ball enters the water, that its direction is to be changed, and that its motion in $A C$, being composed of a horizontal motion, equal to $B C$, and a perpendicular one equal to $A B$, we are only to consider this latter, since the former makes no opposition thereto; and again, that this ball finds no more resistance on one side than on the other, till such time as

half its magnitude is immersed under water; for which reason, if the bulk of water whose place it possesses, were equal in weight to half the ball, (as would be the case, if the ball was shot into melted lead,) it is evident the ball would lose near half its velocity; but it being only water that opposes its motion, and the weight of lead being to that of water as 12 to 1, if in meeting with the bulk of water equal to its own, it must only lose one twelfth part of its motion, since, as already observed, the resistances of fluid bodies to their being separated, are in the ratio of their densities or weight; but as here we have only half to consider, the ball must only lose one twenty-fourth part of its vertical motion; that is, a twenty-fourth part of A B, which being but a small matter, the change of direction must necessarily be insensible. If it be alleged, that this twenty-fourth part should be considerable enough to be perceived, by reason it must be referred to this, that the ball has two boards and a pasteboard to pierce, which may occasion some little alteration in its motion: perhaps the motion of gravity of the ball might likewise be considered, which has a tendency to carry it directly downwards, and consequently, to prevent its change of determination from being sensible; but the great velocity of the ball, and the little space it passes, must render this next to nothing. It is otherwise, however, with the rays of light, by reason of the passage from air to water, or other transparent mediums. There is no proper local motion, but only certain inequalities of pression, or resistance, in the different mediums, as has been explained elsewhere; so that this does not hinder us from concluding, that the rays of light always pass more easily into densest mediums, and that it is on this account, they approach towards the perpendicular.

It must be observed, however, that if a ball be shot very obliquely, so that the angle of incidence only contains a few degrees, its horizontal motion being now very great with regard to the vertical one, it may meet such a multitude of particles of water at the same time, as may prevent its entering, and oblige it to rebound; and such is the case, where we make what the boys call 'ducks and drakes.'

The second thing to be considered in these experiments, is the flattening of the balls upon meeting the water; and at first sight, it may seem surprising, that a fluid body, such as water, which yields and divides so readily, should make a resistance like a solid body; but if the great velocity of the ball be considered, it will appear possible for it to meet such a quantity of particles of water at the same time, as that their resistance shall be equivalent to that of a hard body, and turn it flat. In drawing the hand with some velocity through the water, we find a certain resistance; and if it be drawn with twice the velocity, the resistance will be fourfold, since we have twice the number of particles to move in the same time with a double velocity; and if the same hand be drawn with thrice the swiftness, the resistance will be 9 times greater; so that the resistances increase in the ratio of the squares of the velocities. Hence the velocity of the hand may be so great, as that the particles of water it meets in any given time may afford it a resistance equal to that of a hard body: in effect, if the hand be stretched parallel to the surface of the water, and struck with nimbleness against this surface, the resistance will be so great as to be painful; and I remember, that beating the water strongly one day with a stick, it broke in my hand.

From hence it is easy to account for the flattening of musket-balls shot into water, and what confirms the theory is, that, the higher the piece is charged, the more flattened are the balls found; for that having a greater velocity, they meet more particles of water in the same time.—And hence we may account for why an end of a candle, being loaded in a fowling piece, will pierce a thick plank of wood.

ARTICLE IV.

A short examination of the statements contained in a work entitled, "A circumstantial and explanatory account of experiments lately made at the Royal Artillery Depot at Woolwich, before a select Committee of General and Field Officers of Artillery, assembled by the directions of the Master General and Board of Ordnance, with a view of ascertaining the comparative accuracy of the relative times of burning of fuzes driven by a machine, opposed to those of the common description, with a correspondence carried on in the years 1817 and 1818, on this and other important branches of the science of Artillery, &c. By John Macdonald, Esq. F. R. S. F. A. S. C. D. E. R. C. late Lieut. Colonel, Chief Engineer and Commandant of Artillery at Sumatra."

SEVERAL copies of this work have lately made their appearance in Bengal; and a few copies came in a direct and official manner from the Honorable Court of Directors. It is probable that the same steps may have been taken to circulate this work at the other presidencies. A slight examination of the contents of the above work may not be unacceptable to the Artillery branch of the Armies of the three presidencies.

The work is dedicated to the Earl of Mulgrave, late Master General of the Ordnance, and it would appear from the dedication, that some important, useful, and successful experiments had been made at Woolwich, which the general voice of Artillerists called for the publication of. But the following clauses in the dedication and preface require particularly to be noticed.

"If the efficacy of my invention had not been fully proved in India *thirty-two years ago*, (about 1787) as well as lately in India, assuredly I would not have troubled your Lordship to bring forward in this country a *manifest improvement*, whose accuracy has been again established by the test of repeated experiment. Having been directed in 1787 to proceed to Prince of Wales' Island and Calcutta, orders were issued that fuzes driven by the hand should be publicly tried against those produced by the engine. The Commander of the Artillery under the Bengal establishment, (Col. Pearse), in preparing for the expected trial, directed a number of men to drive fuzes, which were tried from time to time. At length a few men were selected whose steadiness could be depended upon; and certainly the fuzes produced at the subsequent trial, (though some of them varied as much as recently at Woolwich,) were very superior to the masses of this article generally provided in arsenals; where a similar selection of drivers could not supply the exigencies of the service, even supposing that they could furnish unexceptionable fuzes."

"The public comparative experiments took place in Fort William, in the presence of a committee of old officers. The majority, or nearly the whole of the fuzes driven by engine burnt in equal times; the average variation of the whole tried, not exceeding a quarter of a second; while the select specimens, driven by the hand, in a few instances burnt uniformly, and frequently varied some seconds."

"The accuracy of the machine was manifest: but either owing to my belonging to another corps, or to want of influence with the Commander of the Artillery, this evident improvement remained a dead letter, till accidentally restored twenty-nine years afterwards."

The circumstances which attended the experiments made in Bengal under Colonel Pearse, as to the comparison between fuzes driven by the hand and by the engine, having been often related to the Editor of the Repository, by the late Major General Grace, he feels it but justice to the memory of that distinguished officer, Colonel Pearse, to make it public, in order that it may, in some degree, act as a counter-statement to the assertions of Colonel Macdonald.

Colonel Grace was, at the time of the experiment, Lieutenant in the regiment, Brigade Major of Artillery, and Colonel Pearse's confidential staff officer. He was ordered to take a party of men from the regiment to prepare a set of fuzes for the experiment mentioned above; and the result was, that no advantage whatever appeared to be gained by Colonel Macdonald's engine; the fuzes driven by the hand being, if any thing, found superior to those made by the engine; and in all cases burning longer than the latter, as they were found to do at Woolwich in the recent experiment.

When the Marquis of Hastings was at Futtyghur, Captain Byers, being on his Lordship's staff, made a model of the engine for driving fuzes, and proposed that it should be tried, which the Most Noble the Marquis of Hastings, with that distinguished liberality and condescension which mark his Lordship's character, acceded to, and sent the model to Colonel Grace, then commanding the Artillery in the field, with the proposals of Captain Byers. Colonel Grace, upon receiving it, laid before the Marquis of Hastings his statement of the experiment which had been made in 1787, under Colonel Pearse. The above was the substance of Colonel Grace's statement, as far as the Editor can recollect. A letter from Captain Byers, however, appears as follows—

To Colonel Macdonald.

"MY DEAR SIR,

"Though your labors have been directed, and your time devoted to a subject of such importance as to have left you but little leisure for the recollection of your earlier inventions, it may not, I apprehend, be wholly uninteresting to you to hear, how far I have been successful in bringing into notice your machine for driving fuzes."

"During my services in India, I met with your translation of a little work by the Chevalier Duteil, in which is a note (by the translator) on the subject of fuzes, and a plan for correcting the inaccuracies which often arise out of the unequal manner in which they are driven. I had always conceived that five out of six causes mentioned by you, might, by attention, be removed; but one *unprovided* for, and certainly that of the *first* consequence, still remained in all its force, as an objection to the system of *driving* fuzes."

"You may, therefore, judge of the satisfaction I experienced in making myself master of the plan proposed by you; and how desirous I felt to submit it to the consideration of the highest authorities in India."

"Situated as I then was, on the staff of the Most Noble the Governor General, and knowing with what facility his Lordship's great and comprehensive mind can accommodate itself to an inquiry, even into the most minute particulars which relate to every branch of the service, I did not hesitate to lay before his Lordship a model of the instrument, who immediately did me the honor to sanction its construction, under my superintendence, in the arsenal of Futtyghur."

"The instrument was made without the slightest deviation from your plan, and remarks; and after several experiments, in which every species of fuze in the stores was tried, and compared with those driven by the instrument, I submitted to his Lordship a course of results *most decidedly in favor of those driven by the instrument*, and had the pleasure of having it honored by his Lordship's unqualified approbation."

"From the loss of a large part of my papers, I have not the experiments and data on which I founded the report laid before Lord Hastings. I regret this circumstance, as it prevents me from entering so freely into the merits of the subject, as I could have wished. But, however, you will be pleased to learn, that, before I left Futtighur, instructions had been given for the machine to be sent to Cawnpore, in order to be used in the arsenal, for the construction of others, and, I hope, its general adoption throughout the service."

"I am,

My dear Sir,

Your very faithful and obedient servant,

(Signed) SPARKS BYERS."

Then follows Colonel Macdonald's letter to Captain Byers in reply—

To Captain Sparks Byers, Royal Artillery.

9, Keppel St. Russell Sqr., 16th May, 1817.

"MY DEAR SIR,

"I deemed it a duty to the service, and to you, to state to the Court of Directors, and to the Master General of the Ordnance, the steps you took, with a zeal so highly creditable to yourself, to confirm, after a lapse of thirty-two years, the mode of *driving fuzes advantageously*."

"As you intend to return to a country where your services have been already so distinguished, let me request that you will present from me the accompanying work; or dictionary, containing a System of General Telegraphic Communication, to Marquis Hastings, who is so well qualified to judge of the subject. I have said in my letter, that you would be well calculated to carry into effect a system intended to be sent to India, accompanied with models to facilitate progress. The copy I offer to yourself, will enable you to be thoroughly master of the subject, previously to your arrival in India."

I am,

My dear Sir,

with much regard,

Your's truly,

(Signed) JOHN MACDONALD."

"P. S. I would recommend a trial of the mode of causing shells to explode at the instant of coming in contact with the ground."

After a dedication of eleven pages, and a preface of fifty-four, in which a variety of matter on various subjects is introduced, the reader arrives at page 1 of the book, being under the head of 'An account of experiments made at Woolwich in 1817 and 1818, proving the accuracy of an engine for driving fuzes; with a correspondence on the subject, bearing reference to various important branches of the science of Projectiles, &c. &c.' A most appropriate motto for the book, which is equally applicable to the preface, has been chosen by the author.

Nihil est aliud magnum, quàm multa minuta. Phæd.

The letter to the Chairman of the Honorable Court of Directors must not be passed by.

To the Honorable the Chairman and Court of Directors
of the Honorable the United Company of Merchants
of England trading to the East Indies.

"43, Mortimer Street, 2nd May, 1817.

"HONORABLE SIR AND SIRs,

"I beg leave to state, that thirty-two years ago, when in command of an Artillery corps in your service, I invented, and made known various plans for improving the science of Artillery, and Projectiles. I demonstrated the efficacy of my improvements; but either want of interest, or prejudice, rendered my efforts ineffectual."

"Captain Byers of the Royal Artillery, an officer of distinguished service in India, (and whose father died in retirement from one of your establishments,) sent me the enclosed letter, distinctly stating the truth of an important invention, which has been so long neglected, and which Artillery officers can duly appreciate."

"I feel it my duty to lay this letter before the Honorable Court; and to present a copy of the work in which Captain Byers, accidentally, met with the plan which the Governor General, with that knowledge of science for which he is eminent, directed to be carried into execution."

"I use the freedom to remark, that the little work I present, is in the hands of most Officers of Artillery; and that it contains *other inventions* and improvements of, probably, equal utility and importance, in the estimation of most of the officers in that corps."

"I have the honor to be,
with the utmost respect,
&c. &c. &c.

(Signed) JOHN MACDONALD."

Also the following—

*To the Right Honorable the Earl of Mulgrave,
Master General of Ordnance, &c. &c.*

“43, Mortimer St., 12th May, 1817.

“MY LORD,

“The distinguished services of Captain Byers, of the Royal Artillery, may not be unknown to your Lordship. Being myself an old Officer of Engineers and Artillery, I entertain a high sense of this Officer's professional knowledge, and general information : and the enclosed letter, written at my request, furnishes, at least, some proof of the justness of my opinion.”

“I, thirty-two years ago, proved experimentally, in India, the efficacy of a mode I invented for driving fuzes calculated to burn in *equal times*. Prejudice prevented the adoption of a plan which Captain Byers, with a commendable zeal for the good of the service, has again brought into effectual notice, under the authority and sanction of the Marquis of Hastings, a Nobleman of great scientific acquirements, and high general character.”

“I should be deficient in that duty I owe to the public service, were I not to lay Captain Byers's very distinct communication before the Master General of His Majesty's Ordnance, who must be sensible of the *very great importance* of accurately burning fuzes, in their application to all descriptions of projectiles.”

“I believe I had the honor of sending to your Lordship a copy of the accompanying work, in which the mode of driving fuzes, with animadversion to usual errors, is minutely described. The work also contains various detailed disquisitions, on several essential points of Artillery-Science, that I am not aware of being found in any other publication ; and more especially, a mode of causing

shells to explode at the instant of coming in contact with the ground."

"A neat model of this contrivance I sent to Lord Chatham, while Master General. This has been long considered a desideratum, and I presume it ought to be brought to the test of experiment. My constant employment as an Engineer, in India, prevented my making so interesting a trial."

"I have the honor to be,
with much respect,

My Lord,

&c. &c. &c.

(Signed) JOHN MACDONALD."

"P. S. The original of Captain Byers's letter, I forwarded to the Court of Directors of the East India Company."

The first letter contains a sweeping declaration, that either want of interest, or prejudice, rendered the Colonel's efforts ineffectual; and the second, a decided assertion, that prejudice prevented the adoption of the plan. From the above letters, and those which follow, we are led to suppose, that the plans of Colonel Macdonald, again brought into notice by Captain Byers in India, have been adopted, and are now in general use in the arsenals here, for driving fuzes; and that the plans which the prejudice of Colonel Pearse had successfully opposed, were adopted by the modern Indian Artillerist. The reverse, however, is the case; for the experiments which were tried with the engine for driving fuzes, have been unsatisfactory. The machine now lies unused in the magazine of Allahabad, and the original model, the Editor believes, has come into his possession, at the sale

of some of the effects of the late General Grace; and is now in the model-room at Dum Dum.

Colonel Pearse is well known to have piqued himself, particularly, upon the instructions which his men received under his own superintendence, in laboratory duties; even from the first year of his having received the command of the Bengal Artillery in 1772. It is not likely, therefore, that on account of the proposed comparative experiments in 1787, it was necessary to drill a particular set of men, in the simple and easy process of driving fuzes by the hand, though Colonel Macdonald asserts this to have been the case.

But let us now examine what has passed at Woolwich. The following letters from Sir William Congreve exhibit his opinion previous to the trial of the engine.—

“Woolwich, 9th June, 1817.

“DEAR SIR,

“The perusal of the enclosed copy of a letter which I wrote to General Farrington, in consequence of some experiments which I had tried as to the driving of fuzes, will, I trust, convince you that I have no partiality as to any of the different machines proposed for that purpose, which, I am sorry to say, it appears by your letter that you imagine. On the contrary, I think you will admit that the experiments detailed in that letter have fully justified the opinion which I have long since entertained from what I have seen in this description of process, that no advantage is to be derived from any machine, *as to the accuracy of the time of burning*—though bad fuzes will occasionally occur in any way of driving, either from an improper mixture of the composition, or from some failure or imperfection in the wood.”

"It certainly, therefore, never entered into my head to try one in preference to another. On the contrary, I distinctly proposed to try both, and assigned as a further reason for carrying on the experiment, that I conceived some advantage might, at all events, be derived in point of economy, by a due arrangement of machinery."

"I am not aware what the press has to do with the question—had I thought otherwise than I have done for some time past, I should have felt it my duty to have had recourse to the fuze-driving machines which we have already in the laboratory, one of which, as well as the driving large rockets by machinery (for small ones are still driven by the hand) existed long before I had the pleasure of seeing your book at Dover."

"I am,

Dear Sir,

"Your obedient Servant.

(Signed) WILLIAM CONGREVE."

"P. S. When I use the words 'No advantage as to accuracy of burning,' I mean it literally; not that the machine may not make *as good* fuzes as are driven by hand, but *not better*; and consequently, that *no advantage* will be derived, unless, by due arrangement, it can be obtained in point of economy, which would certainly not be the case in any of the machines as they now stand. The comparative trials, however, are ordered, as I proposed at the committee; and I should be glad to know what weights you propose in your machine, and from what heights they are to fall, as the machine is to be made in the laboratory."

"W. C."

(Copy) To Lieutenant General Farrington, &c.

"Royal laboratory, Woolwich, 28th May, 1817.

"SIR,

"In consequence of the discussion on Colonel Macdonald's plan for driving fuzes, at the select committee, the other day, I have tried the following experiments"—

"First,—I caused four 8-inch fuzes to be driven with 15 blows (the regulated number) to each ladleful—a second with 10 blows—a third with seven blows, and a fourth with 5 blows, and found that they all burnt equally well, and, as nearly as possible, the true time : viz. 30 seconds, not varying any of them half a second more or less ; and I herewith transmit 4 fuzes split which were driven in this manner, and which, on examination, the committee will find to be equally solid."

"Secondly,—I caused an 8-inch fuze to be driven with only 5 blows to each ladleful, and with hammers of different weights. Some of the ladlesful of composition being driven with a 10 inch,—some with an 8-inch, and some with a 5½ inch hammer *promiscuously*, which fuze was found to burn quite as uniformly, and for the same time, as an 8 inch fuze driven entirely with the regulated 8 inch hammer."

"Having been called to the committee, therefore, I think it my duty to report this to you, for the information of the Master General and Board of Ordnance ; because I conceive it to be a *most conclusive evidence* that no advantage as to accuracy of time of burning can be obtained, or indeed *need be sought for, by the application of machinery*. But at the same time, I think it right also to state, that I do conceive, by a due arrangement, some advantage may be obtained in point of economy,

should the Master General and Board of Ordnance think fit to pursue the experiment in that point of view, although it does not appear that economy has been the object, or at least any saving is accomplished, either by Colonel Sir Howard Douglas's machine, or Colonel Macdonald's: as the former, in its present state, requires one person to each mould, to feed and regulate the elevating screw and drift, besides two men to turn the wheel for 10 moulds, at the same time that it will not drive a greater number of fuzes in a given time, nor indeed so many as may be driven by an equal number of hands in the common way, especially with the reduced number of blows, which renders it *at least* as expensive as the common mode by hand; while Colonel Macdonald's requires two men or the time of two men, if one only is employed to each mould, and is consequently, *as at present proposed*, much more expensive than the common mode by hand."

"To obtain, therefore, any advantage, it is evident that the number of persons now required must be got rid of, by making the machine feed and regulate itself, which may certainly be accomplished by an apparatus similar to what I have for some time past contemplated for the more complete and economical making of rockets on the large scale."

"I have the honor to be,

Sir,

Your obedient Servant,

(Signed) WILLIAM CONGREVE,

Comptroller."

"P. S. I ought to state that Colonel Bingham has a machine in the laboratory for driving fuzes, by the perpendicular fall of the weight similar to Colonel Macdo-

nald's, but with the addition of a barrel and winch for raising and discharging the weight, so as to work a number by one motion."

"If a boy be trusted to feed and regulate this machine, he may equally well be made to drive the fuzes by hand: a point which I have accordingly put to the test of experiment, finding that the operation neither requires the force nor nicety that has been supposed; so that I am fully satisfied we should be able advantageously to substitute boys for this service, even in driving fuzes by hand."

The report of the select Committee then appears as follows—

" Present.

LIEUT. GENERAL SIR THOMAS BLOOMFIELD.

MAJOR GENERAL CUPPAGE.

MAJOR GENERAL WILLINGTON.

MAJOR GENERAL BORTHWICK.

COLONEL MILLAR."

To Earl Mulgrave, &c. &c.

" Woolwich, 25th May, 1818.

" MY LORD,

" Having, in obedience to your Lordship's commands, communicated through Lieut. Col. Chapman the 15th May, and the 11th and 25th June, 1817, submitted to the consideration of the select Committee of officers above-named, the method of driving fuzes as proposed by Colonel Macdonald, I have the honor to acquaint your Lordship, that the Committee assembled this day to witness a comparative trial, between fuzes driven by the machine as suggested by the above gentleman, and fuzes driven by the hand, according to the usual method."

"The machine proposed by Colonel Macdonald is somewhat similar to a pile driver, whose operation was expected to produce a more perfect condensation of the fuze composition, and a greater uniformity of burning."

"The Committee having met at the laboratory in the Royal Arsenal, several fuzes of different natures were submitted to the test of time of burning, when the 13-inch fuzes of 21 blows driven by hand, burnt 39 seconds; and those of 7 blows driven by the machine, burnt only 35 seconds. Another trial was then made with 13-inch fuzes of 13 blows, driven by hand, which burnt 37 seconds, and those driven, as before, by the machine, only 35 seconds."

"The Committee having inspected the machine, and its manner of operating, as described by the Colonel in his publication, directed two 8-inch fuzes to be driven, one by the machine, and the other by the hand, the first with 7 blows, the latter with 15, when it appeared that the fuze driven by hand was completed in half the time of that driven by the machine; and on their being burnt, the one driven by hand exceeded the time of that by the machine, by 2 seconds, being as 29 to 27."

"Some fuzes being cut longitudinally to ascertain the comparative degrees of hardness or condensation, it was very apparent that those driven by hand, receiving only 13 blows, possessed a greater superiority."

"The Committee, therefore, are of opinion, that the merits which Colonel Macdonald attributes to the machine, are not so manifest as to induce them to recommend a departure from the present mode of driving fuzes."

"I have, &c.

A. FARRINGTON,
General."

On this report is a letter to the Earl of Mulgrave, in which Colonel Macdonald makes some *rather severe* observations upon the select Committee's report, and upon Sir W. Congreve. It appears, however, that the fuze engine has not met with more success at Woolwich than in Bengal; and probably Colonel Macdonald may find out, that the same prejudice which he complains of (against the engine,) still exists in India; it is to be feared, however, that the Colonel has not been able to convince himself that this prejudice is founded in justice.

Let the fuze-driving engine, therefore, rest for the present, though Colonel Macdonald says, "*If I had not published an account of the fuze-machine, it would not be, as it now is, in full activity in India.*"

Another invention or plan of the Colonel's is now brought forward, and the importance of it insisted upon in every part of the work; dedication, preface, and contents. It is a mode of causing a shell to burst the instant it comes in contact with the ground, and the Colonel seems to entertain hopes that his Royal Highness the Prince Regent, will confer some honorary distinction on the inventor of a successful mode of doing this; and to feel some degree of confidence in entering the lists of competitors.

The Colonel's scheme for effecting his purpose is attended with obvious objections, and it is useless to enter into a description of it. The select Committee very judiciously declined putting it to experiment, being satisfied with referring to the valuable report of the select Committee on the same subject in 1798, which is here given—

" Present.

MAJOR GENERAL DRUMMOND.

MAJOR GENERAL BORTHWICK.

MAJOR GENERAL LLOYD.

COLONEL HUDDLESTONE.

COLONEL LEMOINE.

COLONEL BLOOMFIELD.

LIEUT. COLONEL FAGE.

LIEUT. COLONEL DOUGLAS.

LIEUT. COLONEL MACLEOD.

LIEUT. COLONEL J. SMITH."

*To the Right Honorable and Honorable the Board of
Ordinance.*

" Royal Military Depository, 24th December, 1798.

"RIGHT HONORABLE AND HONORABLE GENTLEMEN,

"The Committee of Colonels and Field officers of the Royal regiment of Artillery, having considered Major Macdonald's idea of a construction for shells, together with his conception of placing an apparatus, so as to occasion a fire or fuze composition to explode and burst, upon the shell touching the ground, have, in consequence, to express great regret that they cannot promise any good effect to the service by the communications in question; and can assure Major Macdonald, that they have been under the absolute necessity of relinquishing many conceptions, on the form of shells and applications of fuzes, which would neither bear the test of real experiment, or were consonant to the laws of projectiles, combined with the number of attentions that must be embraced therewith in the Artillery service."

"The Committee will be very happy to shew Major Macdonald, at Woolwich, the principles upon which the present system of bombardment is conducted, together with many simple contrivances for exploding shells, upon their touching the ground."

"The Committee think it highly just and proper to note, that any gentleman, desirous to improve the science of Artillery, in respect to shells and fuzes, should have the goodness to attend to the following points of effect on the subject, and which are at present in use, viz:—

"That shells of every nature in the British service have been, for these seven years past, constructed upon a principle of rendering every part of the shell as near as possible of equal thickness of metal, so that the centre of gravity should be in the centre of the sphere or periphery, a circumstance of the utmost consequence for the flight of the shell in a true direction. The old mode of forming a shell heavier at the bottom, so as to give greater resistance in that part to the first efforts of the charge of powder in the mortar, and also to render the chances greater for the shell grounding upon that side, have been found, by practice, fallacious and unnecessary. The grand desideratum with shells, is the execution that may arise by number of splinters or fragments in bursting; and it has been perfectly ascertained that the new pattern-shells, from presenting the same thickness of metal, and equal lines of resistance on every side, will produce one-third more pieces upon bursting, than the old pattern-shells, which were disproportionate in texture. This increase of ultimate effect, added to the evident advantage which must arise to the direction of a projectile, by relieving it from any bias or unequal preponderance in its flight, needs no argument; and it

has lately been found, by the Artillery practice at Woolwich, that by simply placing or tying a short piece of cord or line to each lug of the shell will, secure in its descent, the fuze-hole to be always uppermost, and thereby preserve the good condition of the fuze for effect and explosion."

"Should Major Macdonald wish to produce any shells at Woolwich, upon his own construction, to be tried comparatively with those of the present establishment, the Committee will be very ready to attend him through a course of experiments, although their opinion is certainly formed, that a shell of an equal and proportionate thickness of metal, according to its nature, will perfectly resist, even upon its lower surface, the immediate and violent concussion of the discharge. But, on the other hand, they are extremely doubtful whether a shell reversed from the old system, that is, by placing the thinnest or weakest part downwards or next the powder, would not be always liable to split or burst in the mortars, with large charges of powder: and the Committee farther conceive, that the projecting apparatus at the fuze-hole of Major Macdonald's shell would be deranged or crushed in the piece, by that tendency to revolve which all projectiles receive on the first impulse for movement."

"I have, &c.

(Signed) VACY LLOYD,

Major General Commanding."

There are situations in which it would be very desirable to make a shell burst the instant it touches the ground; and the Editor had the pleasure of bringing out a most simple construction of fuze for this purpose, on

his late return from Europe, which completely answers. A most successful trial was made of this fuze at Dum Dum, in the practice season of 1819, and with the permission of Major General Hardwicke, the experiment will be again repeated this year; and the report shall be given in the next number of the Repository, with a description of the fuze.

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ARTICLE V.

On Monsieur Carnot's Theory of Defence by vertical fire.
Extract from the Quarterly Journal of Science, Li-
terature, and the Arts. Vol. VIII.

M. CARNOT, influenced probably by motives which it is not our business to expound or inquire into, has promulgated some singular doctrines respecting the defence of fortified places by *vertical fire*, a system which has long been acknowledged as furnishing an important accessory mean; but not, we believe, till M. Carnot's proposal, ever thought of as the basis of defence.

Sir Howard Douglas has published a small tract, entitled "*Observations on the Motives, Errors, and Tendency, of M. Carnot's Principles of Defence,*" which has furnished us with the following paragraphs; and which may serve to remove the erroneous impressions, which authority so high as that of M. Carnot might otherwise produce.

M. Carnot recommends, that the besieged should begin to make use of vertical fire upon the commencement of the construction of the third parallel; and from that stage of the siege, keep up an incessant discharge of musketry and four-ounce iron balls, at great elevation, upon the enemy's works, so as to form a rain (*pluie*) of shot upon the trenches. The iron balls to be discharged from a number of 12-inch mortars, two of which are placed in the salients of each bastion and ravelin, in the front, or fronts attacked; each mortar throwing 600 balls at every discharge.

M. Carnot introduces his theory of the effect of these balls by observing, that of any number which fall in the trenches, the number that take effect will depend upon the proportion which the unoccupied part of the trench bears to the part which is covered by the men posted and working in it. Thus, supposing a man standing upon a horizontal plane, to cover a space of about a foot square, and a man in the attitude of working, somewhat more, M. Carnot calculates that the projections of the bodies of the men, usually working and posted in the trenches, will occupy about a one hundred and eightieth part of their surface; from which he infers, that of every 180 balls that fall in the trench, one should, according to the doctrine of chances, hit a man; and he does not doubt that it will put him "*hors de combat*."

M. Carnot's idea of the effect of this "*pluie de balles*," is founded upon the velocities which he supposes they will acquire in accelerated descent from the vertex of a very elevated curve. This is manifestly the principle upon which he tries to establish his theory; and this it is which, disregarding for the present the doctrine of chances, Sir Howard Douglas first remarks upon.—

"It is quite clear," says he, "that M. Carnot has formed his theory upon the parabolic hypothesis, which is the theory of a projectile's flight in a non-resisting medium. This theory, considerably erroneous in all cases, is particularly and greatly so with small projectiles; and its deductions, as applied to the velocity of descent of small balls used in very elevated short ranges, are quite fallacious. The velocity of the ball in a horizontal direction (which by this theory would be constant, and to the projectile velocity, as radius to the cosine of the angle of elevation,) being inconsiderable, it is evident that

the effect of vertical fire must depend upon the velocity of descent in the direction of the curve. Estimating this according to the parabolic theory (as the secant of the angle of elevation), the motion would be slowest at the vertex of the curve, and the velocities of the projectile be equal, at equal distances from that point. According to this supposition, we should assign to the descent of small balls, discharged at an elevation of 75° or 80° , such accelerated velocities, as would, if true, be quite sufficient to do good service in the way M. Carnot suggests; but the fact is, that there can be no acceleration beyond a limit which, with small balls, is very much less than is generally imagined."

"From the vertex of the curve, where all the vertical motion is lost, the ball begins to descend by an urging force which is nearly constant, viz: its own weight. This force would produce equal increments of velocity, in equal times *in vacuo*; but in air, the descent of the ball being resisted more and more as the velocity accelerates, the urging force will, at a certain velocity, be opposed by an equal resistance of air; after which there can be no further acceleration of motion, and the ball will continue to descend with a velocity nearly terminal."

In considering this problem as applied to vertical fire, Sir Howard Douglas remarks, that M. Carnot has entirely overlooked *terminal velocity*; "and I shall show," says he, "from his own words, that this is the case. It is not necessary to exhibit here the investigations by which I have established the impotency of M. Carnot's vertical fire; I shall only state the results, so as not to embarrass the conclusions with abstruse matter. The solutions are computed from the theorems given in Dr. Hutton's tracts; and although the results may differ

a little from the truth, yet it is quite clear, that in the descent of the balls, there can be no acceleration of motion beyond a certain limit;—that with small balls this velocity is very much less than persons who have not investigated this curious problem would imagine; and that M. Carnot has evidently overlooked this circumstance.”

“The velocity which a musket ball has acquired when the resistance becomes equal to the weight, or urging force of descent, is only about 180 feet in a second. The potential altitude, or the height from which the ball must descend *in vacuo*, to acquire a velocity equal nearly to the terminal velocity, is 523 feet. Hence, in the first place, it would be a waste of means to use the full charge; for a musket-ball fired upwards with the ordinary quantity of powder, would be projected to a greater height than 523 feet; and it is evident that all above this is unnecessary.”

“The indentation which a musket-ball, moving with a velocity of 180 feet per second, makes on a piece of elm timber, is about one tenth of an inch: this might, perhaps, be sufficient to knock a man down, if by great chance it were to fall upon his head; but in no other case would it put him ‘*hors de combat*.’”

“Now, as to the four-ounce balls. The diameter of a French four-ounce ball, is one inch, two lines, five points; which, reduced to English measure, is 1.28038 inches. Its content is 1.09909 inches. The weight is 4.72247 ounces, if made of cast-iron; and 4.8624 ounces if made of wrought-iron.”

“The terminal velocity of the cast-iron ball, is about 201 feet. The terminal velocity of the wrought-iron ball, is about 204 feet. The potential altitude of the

cast-iron ball is about 631 feet. The potential altitude of the wrought-iron ball is about 650."

"M. Carnot recommends that the balls should be made of hammered iron; but adds, that as the charge of powder for a mortar is small, balls of cast-iron may resist the explosion without breaking, and will answer as well. Now this observation shows that the author had not considered the effect of the air's resistance, nor doubted a sufficiency of force in his vertical fire: for the weight of a ball of hammered iron, is greater than that of a ball of cast-iron of equal diameter; and the superior weight, or urging force, of the former, would generate greater terminal velocity than a lighter ball, of the same size, could acquire; the momenta of the two balls in question, would be as 19 to 18."

"Four-ounce balls, discharged at elevations, even considerably above 45°, to the distance of 120 yards, would not inflict a mortal wound, excepting upon an uncovered head. They would not have force sufficient to break any principal bone; there would be no penetration, but merely a contusion. This certainly would not oblige the besiegers to cover themselves with *blindages*, as M. Carnot imagines; for a strong cap or hat, and a cover of thick leather for the back and shoulders, would be sufficient protection from the effects of his vertical fire with small balls."

"As the quantity of balls required to feed mortars, discharging 600 balls at a time, would be very considerable, M. Carnot observes that cubes of iron, of eight or ten lines side, cut from square bars of this dimension, may be substituted."

"These," he says, "may be fired from mortars, howitzers, or stone-mortars, and will produce the same effect as balls." (page 491, Carnot.)

“ Let us consider this :—10 lines French are equal to .89523 inch English—the content of the cube is .71746 ; its weight is 3.0822 ounces.”

“ Now take a *ball* of the same weight :—Its diameter is 1.111 inch ; its terminal velocity is 185 feet per second ; its potential altitude is 534 feet.”

“ We have no experiments by which we can ascertain the terminal velocity of square shot ; but from comparative experiments with round and flat surfaces, we know that the resistance of the air to the flat end of a cylinder is more than double the resistance to a ball of the same diameter. Thus, although the urging force of a ball and cube of the same weight be the same, yet the surfaces upon which the resistance acts (and very irregularly in regard to the cube) are very different : the surface of the ball is 3.87045, the cube is 4.80862.”

“ From this, together with what has been said respecting the descent of *balls*, we know, and that is enough for our present purpose, that the terminal velocity of the cube must be much less than 185 feet per second ; and consequently, its effect or momentum inferior to that of a 3.08 ounce ball. The motion of a cubical shot will, besides, be quite irregular, descending sometimes with an angle, then a face, then an edge foremost, tumbling over and over, in oblique, irregular directions, without any certainty, excepting that the velocity and effect will be much less than those of a round shot of equal weight.”

ARTICLE VI.

*Opinion and experiments of the late Sir John Horsford
K. C. B. Commandant of the Bengal Artillery, on
Monsieur Carnot's vertical fire.*

THE late Sir John Horsford, in drawing out the proportion of ordnance required for the defence of Fort William in case of a siege, makes the following remarks upon the mode of defence proposed by Monsieur Carnot:—

“As I am of a different way of thinking with regard to the use of mortars from Brevet Lieut. Colonel Jones,* and consider M. Carnot's vertical or curved fire from these pieces in every example which he has given, as the most efficacious projection of the missiles, whatever they may be, iron balls, stones, or grenades, I have adopted his proportions to the utmost extent.” (Page 50, M. S. S. late Sir John Horsford's, in the Bengal Artillery Library. Again at page 133).

“Since writing what is set forth at page 50 of these notes, I have had an opportunity of making a few experiments, in order to ascertain the efficiency, or not, of M. Carnot's vertical fire from mortars in the defence of breaches, and the justness of the animadversions passed on him by Lieut. Colonel Jones. The experiment

* Lieut. Col. Jones, Royal Engineers, in his journals of the sieges in Spain, published in 1814, condemns Monsieur Carnot's project of defence by vertical fire as that of “an enthusiast,” which “would not in any point stand the test of practice.”

“was made on the 6th June, by myself accompanied by Colonel Hardwicke.”

“A line of an indefinite length was marked out. At one end was placed a 13-inch mortar, supposed to be in the retrenchment of the gorge of the bastion, or at the foot of the curtain behind the ravelin as directed by M. Carnot, and at a distance of about 160 or 170 yards from the breach. At 160 or 170 yards was put up a linen curtain, bent into the shape of the flanked angle of the bastion or ravelin, and supposed to represent the breach made on that angle. Behind this curtain, on the continuation of the line towards the field, were set up two rows of bandrols at 10 or 12 feet asunder, intended to represent by the space enclosed by them a column of troops marching to the assault.”

“The 13-inch mortar was twice fired with a charge of 1 pound 4 ounces of powder, and 441 eight-ounce balls, weighing 230 or 231 pounds, at 45° elevation. Almost the whole number fell on the breach, or near it, in the closest order. Few or none of the balls fell between the mortar and the breach. The 13-inch mortar was then fired with a charge of 1 pound 6 ounces of powder, and 900 four-ounce balls, weighing 228 pounds, at 45° elevation. The balls fell on the breach in a close pelting shower, and just beyond it. Lastly, the mortar was fired with 1 pound 8 ounces of powder, and the same number and nature of balls at 45° . The shower of grape then extended from the bottom of the breach about 50 yards, or all along the column of the assailants.”

“The general spread of the grape was above 20 feet, or double the breadth of the head of the column. When viewed in the air on its way to the breach, it had the compact appearance of a large bunch of grapes. On

examining the ground after firing the four rounds, the supposed breach and space occupied by the column of troops, was as it were paved with eight and four-ounce shot. The ground was excessively hard, as the soil of Bengal is, before softened by the rains, yet had the balls made deep cavities in most parts of the space, on which they had fallen."

"The balls were put into tin canisters, each having a strong wooden bottom of about $3\frac{1}{2}$ inches thick."

"It was owing to this bottom that the projectiles issued in the compact manner they did; for by its closing over the charge of powder, and fitting compactly the rounding of the bottom of the bore of the piece, the inflamed fluid of the powder had no means of insinuating itself between the balls, and causing them to diverge or spread, but was obliged to push forward in a lump the whole loading."

"After this experiment with the 13-inch mortar, a 10 and 8-inch mortar were brought and fired, the former with 12, and 13 ounces of powder, and 240 eight-ounce and 532 four-ounce balls; and the latter with 6 and $6\frac{1}{2}$ ounces of powder and 114 eight-ounce, and 228 four-ounce balls at 45° : both pieces with the like proportional effect. These grape, viewed in the air on their way to the breach and column of assailants, had the appearance of a flight of small birds, so close, that the light could just be seen between each other."

"Now Mr. Jones observes, page 369 of his notes, that 'it is well known how uncertain is the range from this kind of weapon. To concentrate such a fire as Carnot mentions would be impossible, it would scatter over the whole surface, from very near the mortar, to the range of the farthest ball.'"

“The experiments made above completely refute his assertion of scattering over the whole surface, especially *from very near the mortar to the range of the farthest ball*; for scarcely one or any ball was found between the mortar and breach, and not a single ball near the mortar.”

“He goes on to say: ‘Who does not at once perceive that a musket fired with 45° elevation, against an object 30 or 40 yards distance, the bullet must of necessity range far beyond the point, or *only be urged with a force not greater than it would receive thrown by hand?*’ and does not the slightest reflection lead to doubt of the power of destruction, of a ball of four ounces weight, ejected to the same or a less distance from a mortar, 13 inches in diameter?”

“Lieut. Colonel Jones has, at last, come from bold assertion ‘to doubt;’ but it does not follow, (admitting his assertions) that, because a bullet discharged from a musket has no momentum in the case he describes, a ball of four ounces discharged from a 13-inch mortar has also no momentum or force. And why preach of only 30 or 40 yards, when M. Carnot expressly describes a distance *of double that length*, when he directs the mortars to be placed behind the gorge of the bastion, or at the foot of the curtain behind the ravelin breached? Or why confine his disquisition to only four-ounce balls, when M. Carnot directs, besides these, much larger balls, *hand grenades, and even the paving stones of the streets?* He accuses M. Carnot of unfairness, and is himself most unfair. But the experiments above alluded to will abundantly shew, whether a four-ounce ball projected from a 13 or 10-inch mortar ‘falls with a force not greater than it would receive if thrown by hand.’”

Dum Dum, 7th June, 1816.

ARTICLE VII.

On the modes of conducting a Military Court of Enquiry.

To Captain Casement, acting Deputy Adjutant General.

SIR,

THE mode of procedure in Courts of Enquiry, not having been prescribed by authority, has occasioned much variety in the manner of conducting them. In some instances, the accused has not been called before the Court; in others, not allowed to advance any thing in his exculpation, or to adduce evidence to that effect.

These and other deviations from regularity tending to defeat the object proposed by such investigations, I have the honor to submit for the consideration of Major General Dickens, commanding in the field, the accompanying observations, with the view of promoting a greater degree of uniformity in the proceedings of Courts of Enquiry hereafter, in case the General should approve of issuing any directions for future observance regarding them. It may be proper to premise, that the intent of a Court of Enquiry being to obtain that general knowledge of the circumstances of a case, as is requisite to determine the propriety or necessity of referring it to a Court Martial, it follows that the statement of the party suspected or accused is material to such information; consequently he should always be present in Court, whenever his attendance is practicable. But as the accused is not obliged to divulge his means of defence, until before a Court competent to pass judgment, he

may decline saying any thing or producing any proof towards the justification: a privilege it can seldom be necessary to avail himself of, except in case when he may have particular reasons for believing a Court Martial to be unavoidable. On most occasions an explanatory observation of what had occurred, together with such palliative remarks as the case may admit of, cannot affect the party's defence, should a Court Martial be resorted to, and yet may frequently tend to prevent that measure.

The Court, having met on the day appointed, should commence the proceedings after the usual form, stating the purposes for which it is held as expressed in orders. The names of the president and members are next inserted, and afterwards the charges or such papers as explain the grounds, or are otherwise illustrative of the subject to be investigated. The party preferring the accusation should then be required by the Court, to state the circumstance on which he founds the charge; which being taken down, he is next to produce his witnesses in confirmation of his assertions, having previously answered all questions put to him by the accused and the Court. When the enquiry is instituted on public grounds, and no particular person present to conduct it, the Court will call for all witnesses who appear to have any knowledge of the matter to be investigated, and take their depositions; and even when held at the suit of an individual, should persons apparently acquainted with any of the circumstances not be produced, it becomes the duty of the Court to require the testimony, if necessary to the fuller knowledge of facts, or to prevent any intentional suppression of information. Any papers produced in the Court of Enquiry which apply to the

subject should be copied into the proceedings, or numbered and attached under circumstances.

The Court having recorded all the information to be obtained through the means of the party preferring the accusation, and its own endeavours, the accused is then to be asked what he may have to offer regarding the charge or subject under enquiry; and whatever he may allege, is accordingly to be entered, together with the evidence of such witnesses as he may adduce in corroboration thereof. But should he decline saying any thing in his vindication, or producing any proofs to that end, the Court has only to enter a remark to that effect, and close its proceedings, subjoining its opinion when directed to do so. The opinion of the Court of Enquiry in general goes only to state, whether, in the judgment of the Court, after due consideration, there does or does not appear sufficient cause to render a Court Martial necessary. Regarding the examination of witnesses, it may not be superfluous to observe, that, when a party producing a witness has done with him, he should next be examined by the opponent, and lastly by the Court; either party being afterwards allowed to put any material question that may have been omitted, or which arises out of the further examination. Witnesses before a Court of Enquiry are commonly not sworn; but that measure has been thought necessary on particular occasions; and perhaps where Native evidence of importance is adduced, that precaution would be advisable. During the time a witness is under examination, other persons, attending to give their testimony in the cause, should not be present in Court. Several instances having shewn that the Native officers are under some misconception regarding the object proposed by a Court of Enquiry, and have thence

been induced to reserve (as they say), for a Court Martial to which they appeal, what they had to urge in their own behalf, it might tend to remove such erroneous impressions, if it were explained to them, that a Court of Enquiry is not assembled with the view of promoting, but rather of preventing a Court Martial; and consequently, whatever they may have to allege in their excuse or justification would probably operate to that effect. It might also induce a more ready acquiescence on their part, if the Court was composed of a President and two members Europeans, and two members Native officers, as observed on some late occasions. A Court so instituted appears to engage more confidence and respect from a Native officer, than one composed of that description of officers alone.

The general orders of the 13th February 1802, are explicit regarding the assembling of Courts of Enquiry, and the manner of reporting and deciding respecting the further points which occur to the Court, as connected with the subject.

I have, &c. &c.

(Signed) T. W. WEGUELIN,

D. J. A. General.

Muttra,

November 12th, 1807.

ARTICLE VIII.

On Cannon Shot.

SEVERAL experiments have been made, at different times and in various places, with shot of divers shapes ; but no form appears as yet to have been found more advantageous than the spherical shot now in use.

An impression, however, still remains on the minds of several ingenious men that other forms may be attended with their advantages. A small brass shot, perforated in three directions directly through the centre, was sent to General Hardwicke in the course of last year. It was supposed, we understand, by the inventor of the plan, that the shot, meeting with less resistance from the air in consequence of the probability of one of the perforations lying in the direction of the range of the shot during its flight, would range with more truth, and with a less charge of powder to a greater distance than common shot.

It was also imagined that, in actions at sea, a shot of this description fixing itself in the side of the enemy's vessel would give admission to the water, while a solid shot would stop the hole in which it lodged completely.

It is desirable that every proposal relating to Ordnance, in any shape whatever which has reason to support it, should be tried at the head quarters of all corps of Artillery, in order that records of such trials might be made, which would set the matter at rest, and establish the use or uselessness of proposed innovations.

Accordingly, with that liberality which distinguishes this Government, an experiment on an extensive scale

relating to shot, and which cannot fail of being interesting, whether the projector establishes his system or not, is about to be made on the proposal of a gentleman in the medical service during the ensuing cold season, at the head quarters of the Bengal Artillery, under the select Committee of Artillery Officers.

We shall refrain from making any remarks whatever upon the proposed experiment for the present; but a faithful account of it shall be rendered in our next.

In Nicholson's Journal page 382, vol. i, the following account of an experiment with rifled shot is given, in which it appears to us that some very useful results were obtained, and sufficient arguments to establish the superiority of spherical shot over the other shapes then tried.

Rifled Shot.

"In the latter end of the year 1789, I was by various considerations induced to think, that the effect which is produced by rifling musketry, might be produced in Artillery, by giving a suitable figure to the shot. It is almost needless to explain this effect. When a bullet is driven along the bore of a piece, it must be acted upon by the internal surface so as to cause a rotation, the axis of which motion will lie across the line of direction. In consequence of this, the re-action of the air will be stronger on one side of the bullet than on the other, and it will deviate from the intended course according to no certain rule. The method of rifling consists in cutting one or more spiral grooves in the hollow surface of the musket, into which the ball is either forcibly rammed down, or conveyed to its place by an aperture at the breech or near the chamber. The lead is thus made to fit the internal screw, and usually takes about half a turn

during its course through the barrel. The axis of this rotation being parallel to the line of direction, it must follow that the resistance of the air will be equal on all sides of the bullet, and it will fly with more certainty to the object of aim. It seemed to me that, if a cylindrical shot with hemispherical ends was thrown out of a common barrel, it might be possible, by means of certain spirals cut on the end surface, to cause the blast of the powder and the resistance of the air to concur in producing the same rotation."

"For this purpose, I took a wooden pattern, and cut the spherical surface into twelve spiral planes, by dividing the equator into the like number of equal parts, and drawing spirals from the points of division obliquely towards the poles. The wood between every pair of contiguous spirals was then taken away, by cutting from the one line parallel to the axis, and from the other perpendicular to a plane passing through it. By this process, when the axis was set upright, there appeared, as it were, twelve roads sloping upwards from the equator towards the pole, bounded on the side next the wood by upright walls; and the shot, when suspended on an axis or centre point, could be blown round very swiftly by the breath directed towards the pole."

"Shot of this kind were made and tried at a foundery in North Wales. By an experiment with a brass gun newly bored, it was ascertained that the shot did really revolve in its course along the bore; but the trials with shot of different weight and dimensions did not promise more accuracy of effect than was obtained by common spherical shot used at the same time. Particular notice was taken of the manner in which the shot struck the butt: the greatest number of times it struck with the

anterior end; sometimes the stroke was made with the broad-side, and, in a few instances, the end which came last out of the gun arrived first at the mark. Hence it appears, that the very slight angular deviation at the mouth of the piece is more than sufficient to counteract any effect which might else have been derived from the subsequent action of the air upon a projectile duly figured."

"It seems, nevertheless, that this principle might be applied to advantage in bar shot. If the ends of this projectile were chamfered or sloped, with respect to the axis, it would pass through the air with a revolution of its extremities, instead of one end following the path of the other as may sometimes be supposed to happen."

"With regard to the execrable practice of war, I think it a decided question, that increase of power is, on the whole, in favor of rectitude and virtue; and that wars are likely to be fewer or less durable, and less pernicious, the more scientifically they are conducted."

ARTICLE IX.

On Mortar practice with the Magnetic Needle.

To the Editor of the Military Repository.

SIR,

The profession of Artillerists has always appeared to me to be one, in its nature, peculiarly interesting to the minds of those engaged in it; whether I am of that branch of the army or not, you will probably never know; but as accidents often lead to great discoveries, and the humblest individual may chance to afford an useful hint for more exalted minds to work upon, I trust that my present communication may not prove an useless waste of time; and as you may perhaps deem what I am going to say, worthy of being inserted in the expected Repository, I will write a few words by way of introduction to what follows.

I am an officer in the Bengal army; and though I may perhaps wear a red coat, yet I have often been an interested spectator of the practice of throwing shells, both in Batteries at the annual practice of the Artillery, and before an Enemy's fort.

I must proceed to say, that I have always felt repugnance and disappointment, at seeing the common mode of Mortar practice, by stretching a thread in the vertical plane of vision with the hands extended, unsupported, and rendered unsteady, even by the very pulsations of the current of life.

In observing the unsatisfactory glances of the Artillery officer, first at the flag staff, then at the chalked line of

metal on the mortar, and so on alternately, until after a considerable delay, notwithstanding all his endeavours, he remains in anxious uncertainty as to the direction the shell may take, the following mortifying reflections have arisen in my mind :—

First, That after all the boasted extent of the circle of modern science, it should still appear to be so meagre as not to afford the means of ensuring a greater accuracy in the flight of the expensive and important projectile in question.

Secondly, That, if there are means, they have not yet been found out, or the means within our reach have been neglected.

Now, Mr. Editor, when an individual finds fault with an old custom, and attempts to substitute a new one, the very circumstance implies a feeling of superiority on his part, which the world will very readily withhold its assent to ; but while I conceal myself, I trust this sentiment will not be very active in preventing, at any rate, a trial of my scheme, the result to which I hope to learn in a future number of the Repository.

Allow me then to lay before you, and I trust in so doing, before the Artillery of the three Presidencies, amongst whom I feel assured that your work will have extensive circulation, the produce of the workings of my humble mind on this important part of practical Artillery.

My idea is, that, if a good magnetic needle, having a well-divided graduated circle, properly suspended, was applied to a mortar for the purpose of laying its axis in the true direction towards the object to which the fire is to be directed, a greater precision, and more uniform practice in throwing shells would result from its use.

It is true, that I have seen shells very excellently thrown by the mode which I presume to find fault with; but I have seldom seen two shells in succession equally well directed; and allowing all the difficulties arising from the shortness of the piece, and from the nature of the projectile, yet I am of opinion that mortar practice may be very greatly improved, whether by the adoption of the means which I propose, or by any other which may start into light.

By using the magnetic needle, mortar practice may be carried on with as much certainty by night as by day; the bearing of the object to which the fire is to be directed, having been previously ascertained.

To the clever Artillery officer, it is not necessary for me to say what are the best means for applying the magnetic needle to mortars for the purpose intended; he has the means before him, and the materials in his hands. I shall, therefore, only add a few words which may perhaps, assist him in making use of them.

The needle and its graduated circle must be suspended, by being either supported by a single pivot as a common boat compass, or on four pivots on double circles, as in ships' compasses.

The frame or support of the needle might have two small steel points projecting from some part of it, so as to fit into small holes drilled in the metal of the mortar itself, and it must be contrived to fix on and take off with ease and celerity. These holes might be contrived to be in the plane of the axis of the piece, and the graduation of the circle in which the needle is placed might commence from the line of the two points.

It will be necessary, probably, for extreme nicety to observe the quantity of the diurnal variation of the nee-

dle, and a small magnifier might be used to assist the eye in reading off.

For elevating the mortar, a graduated arc might probably be applied to the frame of the needle, having a small pendulum to indicate the angle of elevation.

I have heard that several instruments for laying mortars have at divers times been brought forward; they must, it is to be supposed, have disappointed the expectations of the inventors, by proving insufficient; or if good in practice, from their being expensive, cumbersome, or liable to get out of order, or from similar causes, they have been laid aside: for the Artillery officers in this part of India are not aware of any being now in use.

I remain,

SIR,

A sincere well-wisher
to the prosperity of your undertaking,
MAGNETIC NEEDLE.

In the field,
October 15th, 1821.

ARTICLE X.

Description of an improved T Square.

(See Plate II.)

THE improvement to the common T square, represented in the Plate, consists in applying, between the fixed and moveable bevel piece of the square, the semi-circular brass protractor which is common in every case of mathematical drawing instruments.

By making use of a good rectangular drawing board, any angle may be drawn, by means of this instrument, with considerable accuracy and expedition.

In fixing the protractor, it must be let into the bevel piece the full depth of its thickness of metal, and a small half circle, equal to the semi-diameter of the pin, forming the pivot on which the bevel turns, must be cut out of the protractor at the central mark, so as to bring its diameter into the line passing through the axis of the pivot. The protractor must also be carefully adjusted, so as to bring the point of 90° into the centre of the blade of the T square, when the bevel piece is set at right angles to it.

It is desirable to afford every facility and encouragement to the junior Officers of this Army, in order to induce them to pursue plan drawing, not only as an amusement, but as leading towards future honorable and lucrative employments in the Quarter Master General's, Surveyor General's, and other Departments, besides the many situations in active service in which good draughtsmen are eagerly sought after.

As a considerable difficulty exists in the field in procuring even common drawing instruments, the simplicity of the one represented in the plate, in which the parallel ruler and protractor are combined, may be considered a recommendation to the use of it.

ARTICLE XI.

Description of a Bayonet safeguard.

(See Plate III.)

THE insecure manner in which the bayonet is fixed on the barrel of a musket in the common way, is well known. Instances have been brought forward in which the sepoys of the Native Infantry have tied on their bayonets with the packthread taken from off their bundles of cartridges; and even after all precaution on their parts, during the late wars many instances have occurred in which the enemy has seized the weapon in the charges of these gallant fellows, and wrenched it off the barrel; the small stud on the barrel, called the sight, (generally very loosely put on,) being twisted off altogether.

In consequence of a letter from Captain Skeen of the Bengal Army, in 1820, to Colonel Nicol, Adjutant General, the Military Board requested Major General Hardwicke, Commandant of Artillery, to take the subject into his consideration. General Hardwicke called upon me, in my situation as model-master, to try and produce a remedy to the evil complained of. This was the origin of the invention now described, which has been inspected and approved by many officers of this Army; and I am given to understand, that an Artillery fusée, with its bayonet, as altered to the proposed plan, has been sent to the Honorable Court of Directors to be further examined at home, and adopted if approved of.

A, represents the end of a musket barrel; B, is a strong steel ring which is soldered upon the socket of the bayonet D. C, is a moveable ring of steel, fitting the exterior of the socket of the bayonet with nicety, but at the same time being sufficiently loose to allow the ring to be shifted round. D, is a bayonet fixed with its safeguard; the point of the bayonet is represented as broken off for want of room in the plate.

a a, are two additional studs or wings, which are fastened upon the barrel, calculated greatly to increase the resistance to any violent twisting force exerted on the bayonet. These two studs a a, project through two lateral grooves in the bayonet socket, and the moveable ring C is so cut as to pass over the wings a a in fixing the bayonet; but on shifting the ring C a small degree round, it locks under the wings a a, and the bayonet is securely fastened. b c denotes the two rings B C, as fastened upon the bayonet socket. e, is a small ear in the ring C, formed by the two ends of the steel forming the ring, being flattened and brought together, between the two faces of which a small piece of brass is inserted, and a screw, as seen at e, fastens the whole. The use of this piece of brass is, that, when the moveable ring wears loose at any time, by taking the piece of brass out and filing it thinner, the ring C can be closed upon the bayonet socket, so as to embrace it with the requisite degree of tightness.

There is a small steel pin inserted into the bayonet socket just above the moveable ring C, a portion of the depth of which is filed away at f, so that the pin will only allow of the moveable ring being shifted round a small distance sufficient to lock under the wings a a; and by slightly arching the part of the ring C, which

works under the steel pin, all the effect of a spring is attained without the nicety and delicacy of a thin piece of metal to form one. The pin, being in the rear of the barrel, is not shewn in the plate. The use of this spring is, to enable the soldier to ascertain by his ear that he has fixed or unfixed his bayonet, from the sound which the steel pin makes against the moveable ring C, as it is shifted as far as the pin will allow it, and also to prevent the latter from shifting without some considerable degree of force, which, in the act of fixing or unfixing the bayonet, is obliged to be applied by the finger and thumb applied to the ear e.

The ear e, being covered by the neck of the bayonet, (being just under it,) cannot well be struck with a sword or other weapon so as to unfix the bayonet. The socket of an old bayonet, which is to be altered to this pattern, is to be sawn off in a line with the horizontal part of the groove which receives the sight of the musket, so that only the upper vertical part of the old groove remains. The rings B and C are then to be fitted to the socket and the ring B firmly soldered on.

The socket of the bayonet therefore, with the safeguard, as represented in the plate, is shorter than the common sockets by about one third, and consequently, even with a moveable ring C, the altered bayonet will weigh rather less than before.

The operation of fixing and unfixing bayonets is, with the new safeguard, rendered extremely simple, the weapon being fixed or taken off by a direct downward or upward motion, without requiring that violent blow and diagonal movement in unfixing bayonets, which, according to the present mode, so soon wears them out, and loosens the sight upon the barrel. There is a notch in each ring, and

when the bayonet is locked on, the notches are in one line, and form a sight to take aim by, the thickness of the ring being a little more than the dispart will ensure the fire being low: a circumstance of well-known advantage.

SAMUEL PARLBY,

Captain Bengal Artillery, Model Master,

Dum Dum.

ARTICLE XII.

Description of a new Shot gauge.

AN instrument of the description represented in plate III, seemed to be much wanting. The usual mode of measuring the diameters of shot by means of a pair of Calliper compasses, is very fallacious; and sets of ring gauges merely shew whether a shot is too large or too small, without designating the real diameter.

In Ordnance stores, taken from the enemy, the captured ammunition has to be surveyed, and shot of every description and diameter are found within the walls of the Native fortresses. The present shot gauge in one instant denotes the diameter of any sphere, from a pistol shot to a 13-inch shell, and with a very desirable accuracy.

The gauge may also be used in many instances, in magazines or other places; as in gauging bars of iron, sheet iron, copper, &c. and for similar purposes; or it may be set to a particular distance as a guide to carpenters' and smiths' work of small dimensions.

The principle upon which this gauge is constructed, is simple in the extreme.

It consists of two plates of steel, the upper one of which rises parallel to the lower fixed plate; and thus the interval between them becomes the gauge of any body interposed.

A B is a strong upright of iron.

C is the upper steel plate, which, being attached to the rod *E*, is lifted by it to any height above the lower plate.

D is the lower steel plate securely screwed to the plank.

E is a steel rod divided into inches and 20ths.

a is a shot placed between the two plates, the diameter of which, or the distance between the two plates *C* and *D*, is read off at *b*.

b is a small pinching screw which affords the means of setting the plate *C* at any desired height from *D*.

F is a strong plank forming the table of the instrument; the upright *A B* is firmly fixed in it.

c c are two iron feet on which the instrument stands.

SAMUEL PARLBY,

Captain Bengal Artillery, Model Master,

Dum Dum.

ARTICLE XIII.

General Order, by His Excellency the Most Noble the Governor General in Council.

(Extract from the Government Gazette, Thursday, October 25, 1821.)

Political Department.

Fort William, 20th October, 1821.

MAJOR General Sir John Malcolm having obtained the permission of Government to return to Europe for the recovery of his health, His Excellency the Governor General in Council deems it due to the distinguished character and talents of that meritorious Officer, on the occasion of his approaching departure from India, and consequent resignation of the high and important military and political station which he holds in Malwa, to express in the most public manner the sense which the Government entertains of his eminent merits and services, and the regret with which it regards the necessity that now compels him to retire from the scene where his talents have been displayed with so much credit to himself, and with such signal benefit to the public interests.

To enumerate the various occasions on which Sir John Malcolm has been employed, by successive administrations, to fill the most important diplomatic situations, and for his conduct in which he has frequently received the highest approbation and applause of the Government in India, and the most flattering marks of

the favor and satisfaction of the authorities in England, would far exceed the limits to which the general expression of the consideration and esteem of Government must necessarily be confined.

Although His Excellency the Governor General in Council refrains therefore from the specific mention of the many recorded services which have placed Sir John Malcolm in the first rank of those Officers of the Honorable Company's Service, who have essentially contributed to the renown of the British Arms and Councils in India, His Lordship in Council cannot omit this opportunity of declaring his unqualified approbation of the manner in which Sir John Malcolm has discharged the arduous and important functions of his high political and military station in Malwa.

By a happy combination of qualities which could not fail to win the esteem and confidence both of his own country-men and of the Native inhabitants of all classes, by the unremitting personal exertions and devotion of his time and labor to the maintenance of the interests confided to his charge, and by an enviable talent for inspiring all who acted under his orders with his own energy and zeal, Sir John Malcolm has been enabled, in the successful performance of the duty assigned him in Malwa, to surmount difficulties of no ordinary stamp, and to lay the foundations of repose and prosperity in that extensive province, but recently reclaimed from a state of savage anarchy, and a prey to every species of rapine and devastation.

The Governor General in Council feels assured, that the important services thus rendered to his country by Sir John Malcolm, at the close of an active and distinguished career, will be not less gratefully acknowledged

by the authorities at home, than they are cordially applauded by those under whose immediate orders they have been performed.

By order of his Excellency the Most Noble the Governor General in Council,

GEORGE SWINTON,

Secretary to the Government.

MISCELLANIES.

SIR William Congreve, Bart. has lately published a small quarto work, entitled: 'A concise account of the Origin and Principles of the new class of 24-pounder medium Gun of reduced length and weight, proposed by Sir William Congreve in 1813, and adopted in his Majesty's Navy.'

Ever alive as we trust we are, and as it is our duty to be, to any new work relating to our profession, the hasty perusal of the pages of the above work certainly awakened a lively curiosity, and surely there was no common cause of excitement when we found that the present received theory of projectiles must fall to the ground, if the conclusion drawn from the experiments made by Sir William Congreve can stand the test of fair examination.

We maintain that, if two shot of equal diameters and weight are propelled with equal force at point blank or at equal elevations from two pieces of ordnance, both point blank and extreme ranges will be found nearly similar to each other:

That, if two shot of equal weight and diameter are propelled with unequal force, but at point blank or with equal degrees of elevation, the shot which is propelled with the greatest force, will range farthest, both in point blank and extreme range:

That, if two equal shot are propelled from two pieces of ordnance, so that the one shall range at point blank to nearly double the distance of the other, and yet the former shall fall short of the latter very considerably in

extreme range, the latter shot was propelled with the greatest force; and the causes of the inequality of ranges must be sought for in the sudden elevation or depression of the muzzles of the two pieces of ordnance respectively as the shot passed out of their cylinders; and under these circumstances, which neither time nor space will allow us to expatiate upon now, we will presume to enter into a fair and impartial examination of the contents of the above work in the next number of the Repository.

Colonel Blacker's Memoir, &c. &c.

DURING the progress of our present number through the press, a friend has kindly favored us with the following brief notice of Colonel Blacker's late work, in the sentiments of which we most cordially concur:—

“We have been highly gratified by the persusal of Colonel Blacker's valuable ‘Memoir of the operations of the British Army in India during the Mahratta war of 1817, 1818, and 1819.’ In minuteness of detail, clearness of arrangement, and pertinency of professional comment, this work leaves us little to desire, while the superior opportunities enjoyed by the author, both in his official capacity, and in the liberality with which every authentic source of information was made accessible to him, afford a satisfactory guarantee for the general accuracy of the narrative. In a work of this description, the style is certainly the least important consideration; but in noticing it at all, it would be doing injustice to Colonel Blacker, not to say, that he appears to us to have been

eminently successful throughout his arduous undertaking, in maintaining a chastened, unpretending simplicity of expression, in admirable accordance with the nature of his subject."

"The maps and topographical plans which accompany the work, are beautiful specimens of Military Drawing and Engraving."

Wire Bridges.

SEVERAL Bridges for foot passengers, built of this material, now exist in America: the following is the description of one near Philadelphia, taken from the Portfolio. Vol. I, 1816:—

"It is supported by six wires; each three eighths of an inch in diameter, three on each side of the Bridge. These wires extend, forming a curve, from the garret windows of the wire factory, to a tree on the opposite shore, which is braced by wires in three directions."

"The floor timbers are two feet long, one inch by three, suspended in a horizontal line by stirrups of No. 6 wire at the ends of the Bridge, and No. 9 in the centre, from the curved wires. The floor is eighteen inches wide of inch board, secured to the floor timbers by nails, except where the ends of two boards meet; here in addition to the nails, the boards are kept from separating by wire ties. There is a board, six inches wide on its edge, on each side of the bridge, to which the floor timbers are likewise secured by wires. Three wires, stretched on each side of the bridge along the stirrups, form a barrier to prevent passengers from falling over. The floor is sixteen feet from the water, and four hundred feet in

length. The distance between the two points of suspension of the bridge is four hundred and eight feet.

The whole weight of the wires are	1314 lbs.
Ditto ditto of wood work is	3380 —
Ditto ditto of wrought nails are	8 —

Total weight of the Bridge is 4702 lbs.

Four men could put up a similar bridge in two weeks of good weather, and the whole expense would be about 300 dollars."

There are many situations in India in which a bridge of this description would be found very advantageous; the expense would be trifling, and durability greater than that of any other materials which could be employed, where the points of suspension are necessarily far apart. Such a bridge might be thrown across the Hooghly, from Calcutta to the opposite bank; and probably in Nepaul, in the vicinity of Almorah, and in Bundelcund might be found very useful.

New Church of St. Stephen at Dum Dum.

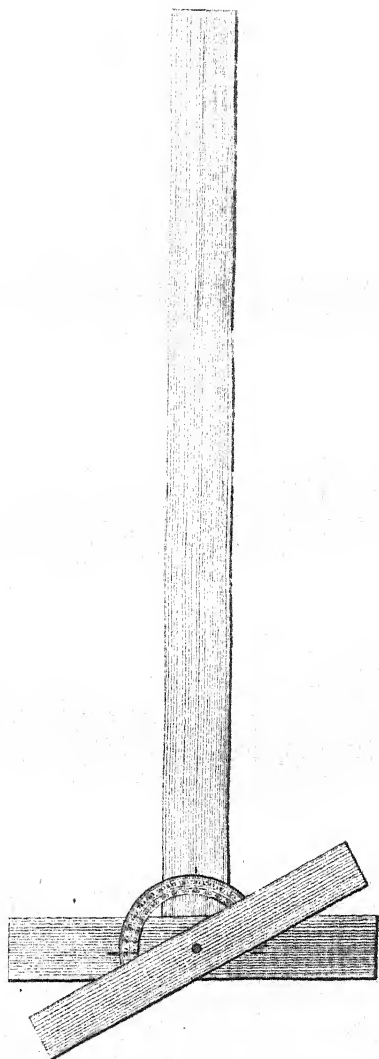
BY the liberality of Government a very handsome and roomy Church has been erected at this station, the Head Quarters of the Bengal Artillery.

The foundation stone was laid with appropriate ceremony, by the Lord Bishop of Calcutta, in August 1819; and the building has been executed and completed in the most excellent and able manner by Captain Charles Campbell of Artillery, the Barrack Master. In the beginning of this year (1821); the Church was opened, and the Christian population of this station have now

reason to rejoice in the regular observance of the Sabbath, under our present most excellent and worthy pastor, the Reverend Dr. Parish.

The very desirable circumstance of having proper edifices for the performance of Divine Worship; at all stations where there are European troops, had too long escaped the attention of the Governments of India; and the erection of St. Stephen's Church at Dunn Dum, will reflect a lasting lustre on the administration of the Marquis of Hastings, amongst the numerous and important events which have been accomplished during his Lordship's Government.

PLATE. 2nd



Improved T. Square

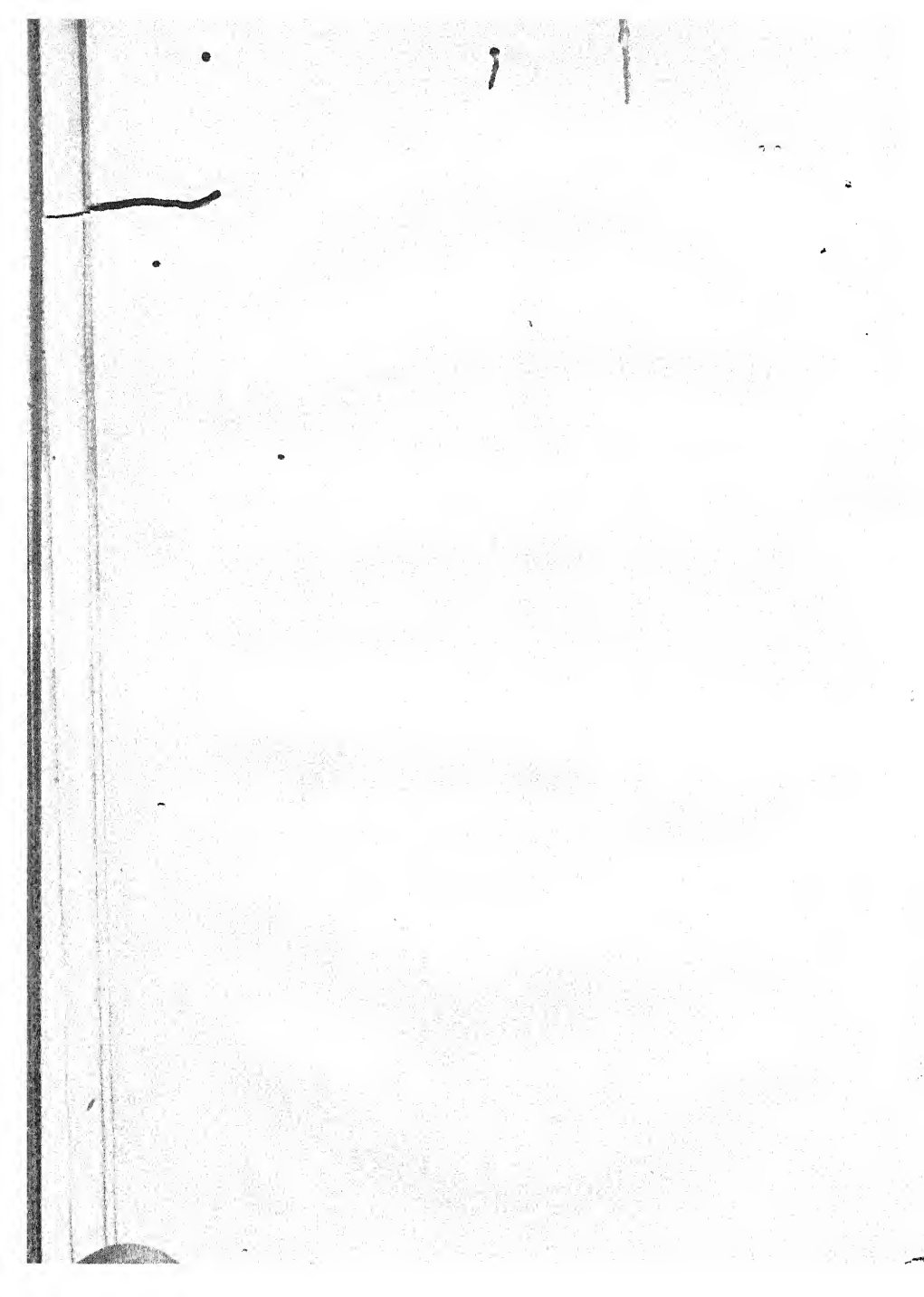
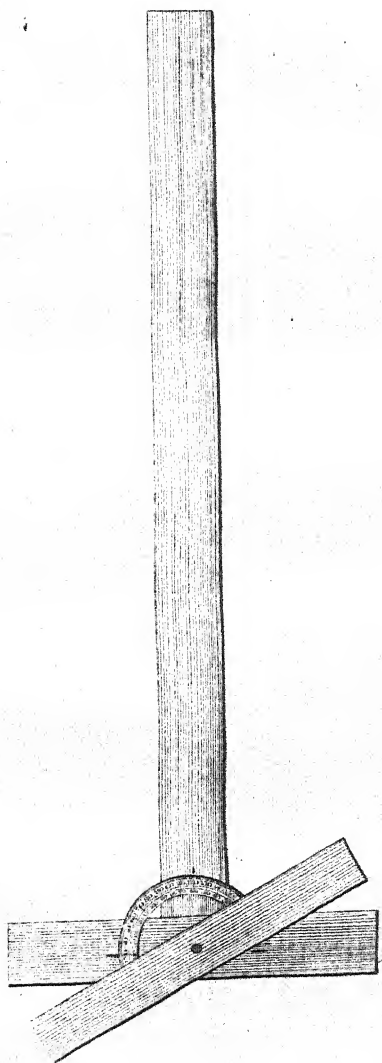


PLATE. 2nd



Improved T-Square

PLATE 13. 3rd

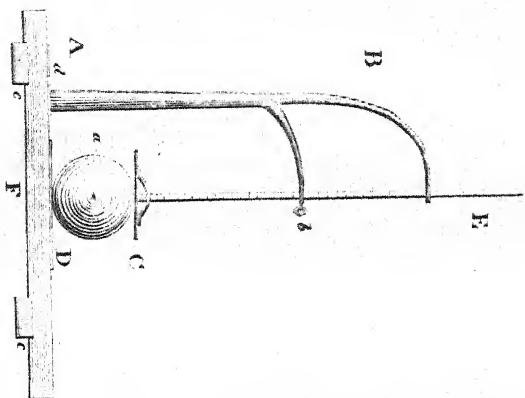


Fig. 1 Shot Gauge
By Wm. C. W. & Co. (1870)

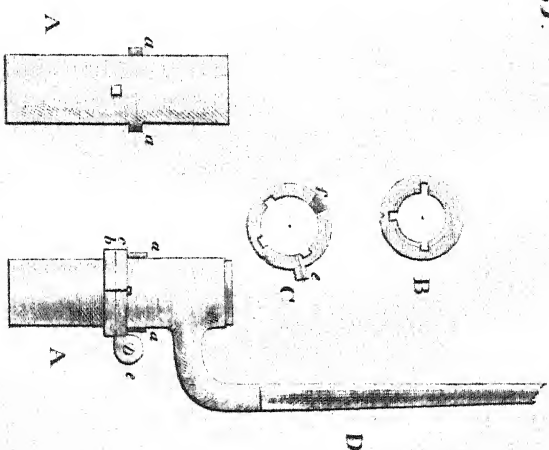


Fig. 2 Bayonet Stagger
By Wm. C. W. & Co. (1870)

THE
BRITISH INDIAN
Military Repository.

No. II.

JULY.

1822.

ARTICLE I.

Memoir of Colonel T. D. Pearse.

(Continued from page 80.)

WE had proceeded in our last number with the Memoir A. D. 1778. of this distinguished Officer as far as the year 1779. Our readers will however we trust excuse our retrograding for a few pages to 1778.

It is pretty generally known that the late Sir John Horsford, K. C. B., and Commandant of the Bengal Artillery, though of a good family and superior education, eventually entering into the profession in which his family were desirous of engaging him, (which we believe was the Church,) by enlisting in the Honorable Company's Service. He came to Bengal as a private in the Artillery, having assumed the name of *Rover*; and in 1778 he was a Sergeant in Captain Thelwall's, or the 1st. Company of Artillery.

The late Sir John Horsford came to India as a private in the Artillery.

In consequence however of the inquiries of his deserted family, Horsford was identified, and promoted to a Cadetship in the corps. The following public letter appears amongst Colonel Pearse's papers:—

A. D. 1778.

*To Captain Thelwall.**Fort William, 9th March, 1778.*

"SIR,

"I am directed by Lieut. Colonel Pearse to acquaint you, that Sergeant Rover of your Company, is in this day's orders appointed a Cadet of Artillery under the name of John Horsford; he desires that he may proceed to the Presidency immediately, in order to join his corps,

"I am Sir,

Your most obedient humble Servant,

C. R. Deare,

Adjt. Corps of Artillery."

The two following letters are interestingly indicative of the acute and observing mind of Colonel Pearse.

*To Admiral Mann.**"Fort William, 3rd April, 1778.*

"MY DEAR FRIEND,

"Captain Atkinson will deliver to you a small box, containing a Barometer made by Ramsden and a letter for him, in which I have given him some directions concerning Barometers, and desired him to repair that which I sent, and to send a fellow to it of the same construction, and also a Wind-Gauge of Dr. Lind's construction, with tubes 15 inches long, which I think our thunder gusts will require. The Barometer which I send, I picked up in India. I received two from Adams, through whose carelessness and neglect, one was utterly useless. Upon opening it I found the tube, which has the female screw of the tap, had been so very carelessly put in, that it had got loose, and the mercury had run out through it. Adams' Thermometers are too short for India. I have seen the mercury 120°; he mistook

my meaning, I wanted Field Barometers, such as Ramsden's; I never had any opinion of Adams, when I was in Europe I had seen some of his instruments very defective,—his being King's Mathematical Instrument Maker makes him careless; but I have seen many instruments of Ramsden's in India exquisitely good. I have an astronomical Quadrant of his make, which is excessively fine; and I have seen refractors of his, little, if any thing inferior to Dolland's: so that I have a very high opinion of him."

"If Adams is your Instrument Maker, tell him to put his Hygrometer into a case with a glass front, and with holes behind to let in the air, but to exclude the wind. Until I made one for mine, it was useless, as it was in perpetual motion; in such a case, it is a very good Instrument. And tell him also of the Thermometer; for those he has fixed to my Barometer will constantly fly to pieces if I should ever go up the country; for, though you will hardly believe me, it is a fact that the heat does exceed 120° , which is the length of his tubes. I have seen it 107° in the shade in Calcutta, where we never have hot winds, and I have been told it is 132° in the tents, and even more sometimes where the hot winds are violent; but as the wind is always scorching, it of course is dry and doth not oppress. I have been ready to die in 83° , in a moist air, and never am in better health or spirits than in the hottest dry weather, in which season my returns shew me my men are always most healthy. I now have not one in 20 sick; from August to the latter end of December they sicken; from that time till the rains begin, they grow more and more healthy; but if they drink hard, they die in a few hours of violent putrid fevers. I inclose a duplicate of my last letter, because

A.D. 1778. it is of important business ; I hope you will receive your wine safe by the Portland.

"May you enjoy every happiness! and now adieu for this season."

"I am, My dear Friend,

Your affectionate Kinsman,

T. D. Pearse."

To Mr. Ramsden, Mathematical Instrument Maker.

"Fort William, 4th April, 1778.

"SIR,

"I have desired a friend to whom I have sent a Barometer of your construction to forward it to you to be repaired. When I got it, it was empty ; in endeavoring to boil the mercury in the tube, a piece broke off, and put an end to my experiment, as I had not any tube fit for the purpose of replacing it. I observe that you have fixed a brass tube to the rackwork, by which, (as I perceive the plane of the lower mouth is perpendicular to the plane of the divided plate) the actual height of the mercury can be ascertained to a very great degree of nicety ; but I see that the first point of the nonius is placed at some distance above the plane of the lower mouth of the tube, the reason of which I do not understand, as it certainly must give the height greater than it ought to be, unless a quantity be subtracted, which is troublesome."

"I think the cup of the reservoir is rather too small, I mean in its length only ; for I imagine that when the leather is forced up by means of the screw, it will touch the end of the tube ; if so, I apprehend that it will be absolutely impossible to prevent air from getting in : for this reason I request that you will leave a greater space

between the end of the tube and the leather; so great, A. D. 1778, that when the screw is forced up to its greatest height, there may be a distance at least equal to the external diameter of the tube between the end and the leather; this I think will effectually exclude the air, because the volume of mercury will be complete from the top of the tube to the mass in the reservoir, which cannot be the case if the leather can touch the tube. The excessive heat of the land winds, at certain seasons, makes it almost impossible sufficiently to season and dry the wooden reservoir; but I think that may be overcome if you will cause the wood to be baked in an oven, and afterwards boil it in fine oil, as is done to deprive wood of its power to conduct electricity. If by this treatment it does not crack, I think it will stand the hot winds, even at 130° of heat, or greater if it ever should be met with. I see your Thermometer is 140° long. I recommend that for this country they should not be shorter. I think, with the full force of the sun in certain situations, the tube may require at least that degree of length. With the one I send you be pleased to send a second, to make corresponding observations of heights."

" Might not the box or reservoir be made of metal, lined with bladder, fixed on with varnish, and covered perfectly by two or three linings one over the other? but it must not be uncovered; for even iron will corrode in time, as accident shewed me in a tube, to the end of which a tube of iron was joined to lengthen it. Perhaps fine cork would be better for the lining; but a glass reservoir, shaped like the wooden one and covered with metal, would be better than either."

" I am, Sir,

Your most obedient humble Servant,
T. D. Pearse."

A. D. 1778. "P. S. With the Barometer please to send me a Wind-Gauge of Dr. Lind's construction; but let the legs be 15 inches long."

To General Pattison.

Attempt to
establish
Ragoba
at Poonah.

"We lately made an attempt to establish Ragoba, the ejected Peshwa of Poonah, in the Government of the Mahratta dominions, and to this end in March 1778, a body of forces under Col. Leslie marched from Calpee towards Poonah, the distance of about 1800 miles. Leslie lost several months in settling some disputes with which he had no business to interfere, in Bundlecund, a country in his route, and there he died: Lt. Col. Goddard succeeded to the command of the detachment. All the difficulties vanished, the detachment marched with great dispatch, crossed the Nerbuddah, and were within a few days march of Poonah. The Bombay forces were also to attack on their side, to second Goddard, and they were so to manage matters as to arrive with him: but Goddard had the only power as ambassador. The Bombay Council then sent their detachment; a Captain in three days took possession of the passes; their army marched the same distance in six weeks; but the Captain moved unfettered, and the army had a set of people called Field Deputies.* As news reached them that Goddard was approaching, the Bombay people held it to be for their credit to arrive first, and they determined to quit the passes, and descend into the plains. They had no sooner done this than they were attacked; still they pushed on, and in three days advanced about 12 miles, their army in the highest spirits. The Field

* These Field Deputies were Mr. Carnac, and Mr. Moystyn, of the Bombay Civil Service, and a Col. Egerton, acting in a Civil capacity.

Deputies, however, chose to retreat; the army got under arms, expecting to storm the Mahratta camp, and make their fortune. All were in transports, when in an instant their ambitious views were defeated by an order to retreat. Away they went. The Mahrattas finding the good people were walking the wrong way, and rightly imagining that making a noise in the rear would make them hasten, therefore attacked it. He who commanded the rear repulsed them, and made good his retreat to the main body.* The front had marched so fast as to leave him 2 miles behind, with a gully between; they stopped, sent back a reinforcement, and all was well. Thus ended the first fight. The next day they began to treat; as they agreed to terms, the Mahrattas rose in demands, so they fought again and again, and then they made their treaty, and it was to give up Ragoba, which was complied with; to eat their dinner, which the Mahrattas agreed to send them; to deliver up Salsette, Baroach, and any thing else the Mahrattas pleased; and to send orders to Goddard to march back again, and at any rate to forbid his taking Poonah and doing his business without their assistance, which the Mahrattas were very seriously afraid he would do. The Deputies politely told the Mahrattas that they had no power over General Goddard, but that he would do as he pleased, as he was ordered by their superiors; but they would interest themselves with him, and so they wrote him a letter, and the Mahrattas another. When Goddard found that one army was demolished, and had bargained that the man he was going to establish was delivered up, and that it would be to no purpose to go to Poonah, and that he might save Bombay by marching to Surat, he determin-

A. D. 1779.
Disasters of
the Bombay
detachment
caused by
the Field
Deputies.

Disgrace-
ful treaty
concluded
by the
Bombay
Deputies.

* This was Captain Hartley, afterwards a Major General.

A. D. 1779. ed to do so; and he has effected it. This affair, though really a very serious one, has been so horridly mangled by the mismanagement of the Bombay Deputies, (whom the Mahrattas call the English coolies,) that though I really wanted to give you an account of it in a more serious style, I really could not manage it. Goddard has done wonders; he has made his way good quite across India; has been twice attacked by the whole force of the Mahrattas, and made them repent it; and has at last reached Surat. The Bombay detachment, much larger than Goddard's, within three days of Poonah, were defeated by the Chiefs at the very instant they thought they were going to drive all before them; and what happened plainly shewed they might have done it: for if part of their force could in a retreat repulse the Mahrattas, their whole force attacking would have destroyed them, and one victory would have made us masters of all the western side of India; and if Goddard had been there without Field Deputies, he would have done it. Sir Eyre Coote has arrived, and has reviewed my corps, and has expressed his delight and satisfaction."

The awful intelligence reaches Calcutta of the defeat of the Madras army, and Hyder Ali's marching to Madras with an immense army.

On the 25th Sept. ~~1779~~, the awful intelligence reached Bengal of the total annihilation of a large detachment of the Madras army, under Col. Baillie, by Hyder Ali: Sir Hector Munro at the head of the Madras army having failed, through imperfect intelligence, to support the detachment.

To render this news more appalling, it was reported that Hyder had followed the retreating army of Sir Hector Munro to the very suburbs of Madras, and the Madras Council, in applying for assistance in money and troops from Bengal, declared their total want of the

1780

former, and that the weakness of their force rendered A. D. 1779. them unable even to check the progress of the barbarous Invader : the Madras army amounting to about 6,500, in which number were included the whole European force of 1,200 men.

According to Mr. Mills (in his admirable history of India) the formidable army of Hyder was not less than 100,000 strong, of which 20,000 Infantry were formed into regular Battalions under European officers, and 30,000 Cavalry which had been disciplined by French officers ; that he had 100 pieces of cannon, partly manœuvred by Europeans and natives who had been trained by the English for the Nabob of the Carnatic ; that Mons. Lally, who had left the service of the Subahdar of the Deccan for that of Hyder, was present with his corps of Europeans to the amount of 400 men, and that he had the principal share in planning the operations of the war.

Here was a striking lesson to every state of the necessity of strict discipline in an army, and the regular payment of the troops composing it.

Hyder's main object was the total extirpation of the English from the Carnatic, and indeed from India, and had he pushed on with his overwhelming force and taken Madras, which in all probability must have fallen, the British interests in the Carnatic would have yielded to the French ; the Mahrattas never would have concluded peace with the English, and that portion, if not the whole of India, would have been lost to Britain. To gratify his troops however, (and probably to pay them,) Hyder was obliged to let them ravage and plunder the country round Madras, and they devoted so much time to this barbarous mode of carrying on war, that rein-

Necessity
of strict
discipline,
and the re-
gular pay-
ment of the
troops com-
posing the
army.

A. D. 1779. forcements from Bengal arrived and warded off, the expected catastrophe.

MrHastings
the saviour
of India.

Never was there a more alarming crisis in the affairs of British India. Fortunately Mr. Hastings, being supported by Mr. Barwell in Council, had recovered the reins of Government, and the vigorous measures which the Supreme Government pursued, notwithstanding the obstinate opposition of Mr. Francis, saved India.

That Mr. Hastings is entitled to the significant and honorable appellation of the *saviour* of India, is now generally allowed; and in speaking of Mr. Hastings, the name and services of his constant supporter and coadjutor in Council, Mr. Barwell, must not be forgotten.

The supreme council determines to support the Madras Presidency in the most vigorous manner.

Sir Eyre Coote directed to proceed to Madras by sea and Col. Pearse by land, in command of an army.

Fifteen lacs of rupees, and a formidable body of Infantry and Artillery, were instantly got in readiness to proceed to Madras. Sir Eyre Coote was directed to proceed by sea with a detachment of Europeans, and Col. Pearse, (whose character was justly valued) was selected to command the army which was to proceed by land. The Supreme Government, confiding in the high character of Sir Eyre Coote, appointed him to carry a decree suspending the Madras Governor. Mr. Hastings in adopting these measures looked forward with confidence to the complete restoration of the British honors and interests in that quarter of India, and his expectations were not disappointed.

To General Pattison.

"25th ~~March~~ 1780.

Sept.

State of affairs described.

"Before this can reach you, you will have heard of the disaster that has happened to our troops at Madras, under Sir Hector Munro. Munro had a certain victory in his hands, if he only would have moved to seize it; but

standing still till it was too late, half his army was destroyed, and the rest he marched off with in such hurry and confusion, that it might be called running away; and he left his cannon, his tents, his magazines, and all the followers of his army." A. D. 1780.

As soon as it was known, our Government took the most vigorous measures; within a month from the receipt of the news, Sir Eyre Coote sailed from hence with 500 Europeans, viz. 300 Infantry and 200 Artillery. I offered my services to go, either to command the detachment, or the Artillery only, or my own Company of volunteers. At first Sir Eyre Coote refused to let me go; but two days after he told me I should follow with the command of 6 light Battalions of sepoys, and a proportionable train. The detachment is accordingly forming and consists of 6 Battalions of sepoys, one Company of Artillery, and 16 pieces of ordnance."

"The Mahrattas are divided; peace is about to be made with them, so that, as the Nizam refuses to join against us, and Mezuph Khawn is quiet and inclined to peace, Hyder Ali's fall may be looked upon as certain, unless the French should send a force to join him, and we should be neglected; in which case they may form an establishment to lay the foundation of future trouble; but if they do not join, or we are supported, all India must be ours in 20 years more: for when Hyder is destroyed, there will not be a force that can cope with us, though all the rest should join together."

"I must just add that in August last, Mr. Hastings and Francis fought a duel; I was second to Mr. Hastings, and Col. Watson to Francis. I consulted your letter on Townsend's for etiquette, and proceeded accordingly; but Watson proposed 14 paces, and it was lucky for his

A. D. 1780. principal, for Mr. Hastings hit him, and had he been two paces nearer he would never have told who hurt him."

"Francis is to go away in these ships, and then we may go on with the conquest of India, which Hastings will assuredly accomplish, if left to act."

"Mayaffre, who is now the fourth Captain in the Corps, is just returned from Gwalior, a very strong fortress in the Rajahship of Gohud; it was in the possession of the Mahrattas, and was taken by surprise by Popham under whom Mayaffre served."

Col. Pearse gives the following account of the duel fought between Mr. Hastings and Mr. Francis in a letter—

To Lawrence Sullivan Esq.

"Fort William, 4th October, 1780.

"SIR,

Account of
the duel
fought be-
tween Mr.
Hastings
and Mr.
Francis.

"On the present occasion I shall less apologize for troubling you than I should on any other, because it seems to me necessary that you should be informed of the particulars of a transaction that has passed here, and which will make some noise at home. I mean a duel between Mr. Hastings and Mr. Francis, on which occasion I was one of the seconds, and therefore am fully acquainted with the particulars which I shall relate as concisely as the nature of the subject will allow me."

"Late in the evening of the 15th August, I received a note from Mr. Hastings, desiring me to be with him next morning at breakfast; in consequence of which I waited upon him. He introduced the subject of business by desiring me to give him my word of honor not to mention it till he should give me permission. Of course I gave it, and he then informed me that in consequence of a minute he had given in, Mr. Francis had

challenged him on the preceding day; that they had then agreed to meet on Thursday morning about half past five near Belvidere, and he asked me to be his second." A.D. 1780.

"The next morning, Thursday the 17th August, I waited on Mr. Hastings in my chariot to carry him to the place of appointment. When we arrived there we found Mr. Francis and Col. Watson walking together, and therefore soon after we alighted, I looked at my watch and mentioned aloud that it was half past five, and Mr. Francis looked at his and said it was near six; this induced me to tell him that my watch was set by my astronomical clock to solar time."

"The place they were at was very improper for the business; it was the road leading to Alipore, at the crossing of it through a double row of trees that formerly had been a walk of Belvidere garden, on the western side of the house. Whilst Col. Watson went by desire of Mr. Francis to fetch his pistols, that Gentleman proposed to go aside from the road into the walk; but Mr. Hastings disapproved of the place because it was full of weeds and dark: the road itself was next mentioned, but was thought by every body too public, as it was near riding time and people might want to pass that way; it was therefore agreed to walk towards Mr Barwell's house on an old road that separated his ground from Belvidere, and before we had gone far, a retired dry spot was chosen as a proper place."

"As soon as this was settled I proceeded to load Mr. Hasting's pistols; those of Mr. Francis were already loaded; when I had delivered one to Mr. Hastings, and Col. Watson had done the same to Mr. Francis, finding the Gentlemen were both unacquainted with the

A. D. 1780. modes usually observed on those occasions, I took the liberty to tell them that if they would fix their distance it was the business of the seconds to measure it. Lieut. Col. Watson immediately mentioned that Fox and Adam had taken fourteen paces, and he recommended that distance. Mr. Hastings observed it was a great distance for pistols; but as no actual objection was made to it Watson measured and I counted. When the Gentlemen had got to their ground, Mr. Hastings asked Mr. Francis if he stood before the line or behind it, and being told behind the mark, he said he would do the same, and immediately took his stand. I then told them it was a rule that neither of them were to quit their ground until they had discharged their pistols, and Col. Watson proposed that both should fire together without taking any advantage. Mr. Hastings asked, if he meant they ought to fire by word of command, and was told he only meant they should fire together, as nearly as could be. These preliminaries were all agreed to, and both parties presented; but Mr. Francis raised his hand and again came down to his present; he did so a second time; when he came to his present, which was the third time of doing so, he drew his trigger; but his powder being damp, the pistol did not fire. Mr. Hastings came down from his present to give Mr. Francis time to rectify his priming, and this was done out of a cartridge with which I supplied him upon finding they had no spare powder."

"Again the Gentlemen took their stands, both presented together, and Mr. Francis fired; Mr. Hastings did the same at the distance of time equal to the counting of one, two, three distinctly, but not greater. His shot took place; Mr. Francis staggered; and in attempting to sit down he fell, and said he was a dead

man. Mr. Hastings hearing this cried out, 'Good God ! A. D. 1780. I hope not', and immediately went up to him, as did Col. Watson ; but I ran to call the servants, and to order a sheet to be brought to bind up the wound ; I was absent about 2 minutes ; on my return I found Mr. Hastings standing by Mr. Francis, but Col. Watson was gone to fetch a cot or palanquin from Belvidere to carry him to town."

"When the sheet was brought, Mr. Hastings and myself bound it round his body ; and we had the satisfaction to find it was not in a vital part, and Mr. Francis agreed with me in opinion as soon as it was mentioned. I offered to attend him to town in my carriage, and Mr. Hastings urged him to go, as my carriage was remarkably easy. Mr. Francis agreed to go, and therefore, when the cot came we proceeded towards the chariot, but were stopped by a deep broad ditch over which we could not carry the cot ; for this reason Mr. Francis was conveyed to Belvidere, attended by Col. Watson, and we went to town to send assistance to meet him ; but he had been prevailed on to accept a room at Belvidere and there the surgeons, Dr. Campbell the principal, and Dr. Francis the Governor's own surgeon, found him. When Dr. Francis returned he informed the Governor that the wound was not mortal, that the ball had struck just behind the bend of the right ribs and passed between the flesh and the bone to the opposite side, from whence it had been extracted."

"Whilst Mr. Francis was lying on the ground, he told Mr. Hastings, in consequence of something which he said, that he best knew how it affected his affairs, and that he had better take care of himself ; to which Mr. Hastings answered, that he hoped and believed the wound was

A. D. 1780. not mortal, but that if any unfortunate accident should happen, it was his intention immediately to surrender himself to the Sheriff."

"Concerning the subject of the quarrel, not a word passed. Had the seconds been ignorant of the cause of the duel before they went into the field, they must have remained so. No other conversation passed between the principals or the seconds besides what I have related, unless the usual compliments of good morrow at meeting, or Mr. Francis' admiring the beauty of Mr. Hastings' pistols when I took them out, deserve to be noticed. When the pistols were delivered by the seconds, Mr. Francis said he was quite unacquainted with these matters, and had never fired a pistol in his life, and Mr. Hastings told him he believed he had no advantage in that respect, as he could not recollect that he had ever fired a pistol above once or twice; this it was that induced me to say what I have before mentioned about the rules to be observed."

"Though what I have written may appear rather prolix, yet I had rather bear the imputation of dwelling too long upon the less important parts of the narrative than leave the world room to put in a word that did not pass. If, therefore, any reports different from what I have related should circulate, and you should think them worth contradiction, I hope you will not scruple to use this letter for that purpose."

"Both parties behaved as became Gentlemen of their high rank and station. Mr. Hastings seemed to be, in a state of such perfect tranquillity that a spectator would not have supposed that he was about an action out of the common course of things; and Mr. Francis' deportment was such as did honor to his firmness and resolution."

"As I could not take the liberty of writing so fully A.D. 1780. on this subject, without acquainting Mr. Hastings of my intention so to do, he knows of my letter; but the letter itself he has not seen, nor any copy of it."

"Wishing you every health and prosperity,

"I remain,

&c. &c. &c."

On the 13th October 1780, Sir Eyre Coote sailed for Sir Eyre Madras, with 330 European Infantry, two companies of ^{Coote sails for Madras.} Artillery of 100 men each, 630 Lascars, and between 40 and 50 Gentlemen volunteers, and arrived at Madras on the 5th November.

Col. Pearse in the mean time, made preparations for fitting out his army to march overland. The army was ordered to assemble at Midnapore, but Col. Pearse remained in Fort William, exerting himself in getting the stores and equipments prepared and forwarded to camp.

A Letter appears written at this time to a Captain Erskine, in reply to an application to go on service with the detachment; it exhibits the high and honorable spirit, which directed the actions of Col. Pearse. It is as follows:—

To Captain Erskine.

"9th November, 1780.

"SIR,

"I received your obliging letter this morning about 9, and consider it an honor that you are pleased to express a wish to go on the detachment I am about to command. Be assured it would give me great pleasure, (for I am no stranger to your merits and abilities, and should be very happy to benefit by them,) if it should

A.D. 1780. have pleased our superiors so to direct it; but in the present case, what can I do to promote it? were I to mention it here, I run a great risk of offending two persons whom I wish to please; the reasons you mention, shew it would be so with the Governor, though upon my word your own letter is the only ground for the supposition, and any interference of mine might be construed into an attempt to invade the rights of the Commander in Chief: for the *right* to recommend such measures is his undoubtedly, and I too well know that many would endeavour to persuade him, that forgetting the distance between us, I had grown intoxicated with my appointment, and aimed at giving laws to him, from whom I ought to receive them. These considerations are the cause why I must be thankful for your kind good wishes, rather than gratify my own inclinations by promoting yours, to which, I hope you will believe me when I assure you I add, my own."

"I am much concerned to find that some officers of the Infantry have conceived so ill-grounded a jealousy against my going on my tour of Command; every other duty I have done with them, ever since I have been in the service; could they suppose I could have submitted to do the drudgery of the service, and not share the honors of it? surely no one could entertain so mean an opinion of me; I hope I never gave room for such a supposition."

"Jennings here, Horn at Madras, and Keating at Bombay, have before been in command; and Philips in the present war in America under Burgoyne, are all instances that it is not a novelty, consequently not an innovation; but admitting it to have been the very first instance, it is

no reason why I, as an officer of the Artillery, should not A. D. 1780. go; for if I am an officer, I must have every right of an officer. In this service Lieut. Colonels do the duty of Generals at home; and who ever heard of prescription there? Commands are given there either from interest, or favour; generally the former, the latter has its season."

"As you did me the honor to mention this subject, I hope you will excuse my shewing, that it is neither new, nor wrong; and the consequence is, that to have passed me over in the Rolster of duties of honor, would have been treating me with an indignity that I trust I shall never deserve, or submit to."

"I am,

Dear Sir,

Your very obedient humble Servant."

[Signed.] T. D. Pearse.

To Sir Robert Barker.

"Fort William, 27th Nov. 1780.

"DEAR SIR,

"I am now in tents opposite the Government House, waiting for my final orders to set out and join a detachment of six Battalions of Sepoys, who are, with a train of 16 Pieces of ordnance, to set out under my command for Madras. To day, news of the fall of Arcot has arrived; the whole force of Madras consists of about 1300 Europeans, and 2000 Sepoys, the relicks of the army that marched out to meet Hyder. I need not tell you that the disaster which befell Munro's army, is the cause of sending the detachment."

"In such a state of things, I dare say you will not expect any accounts of new projects, yet I must trouble

A. D. 1782. you with a model of a new mechanical contrivance, for moving two pistons up and down, alternately, by means of a winch moving round one way; or vice versa, the method of turning a wheel by the up and down motion of a piston, or if you please, a steam-engine. Keane Fitzgerald, in the Philosophical Transactions, has proposed it, but his is a complication of springs, wheels, and cricks. John Stewart carried home a model for doing it with a chain, but this I send, is totally different.*

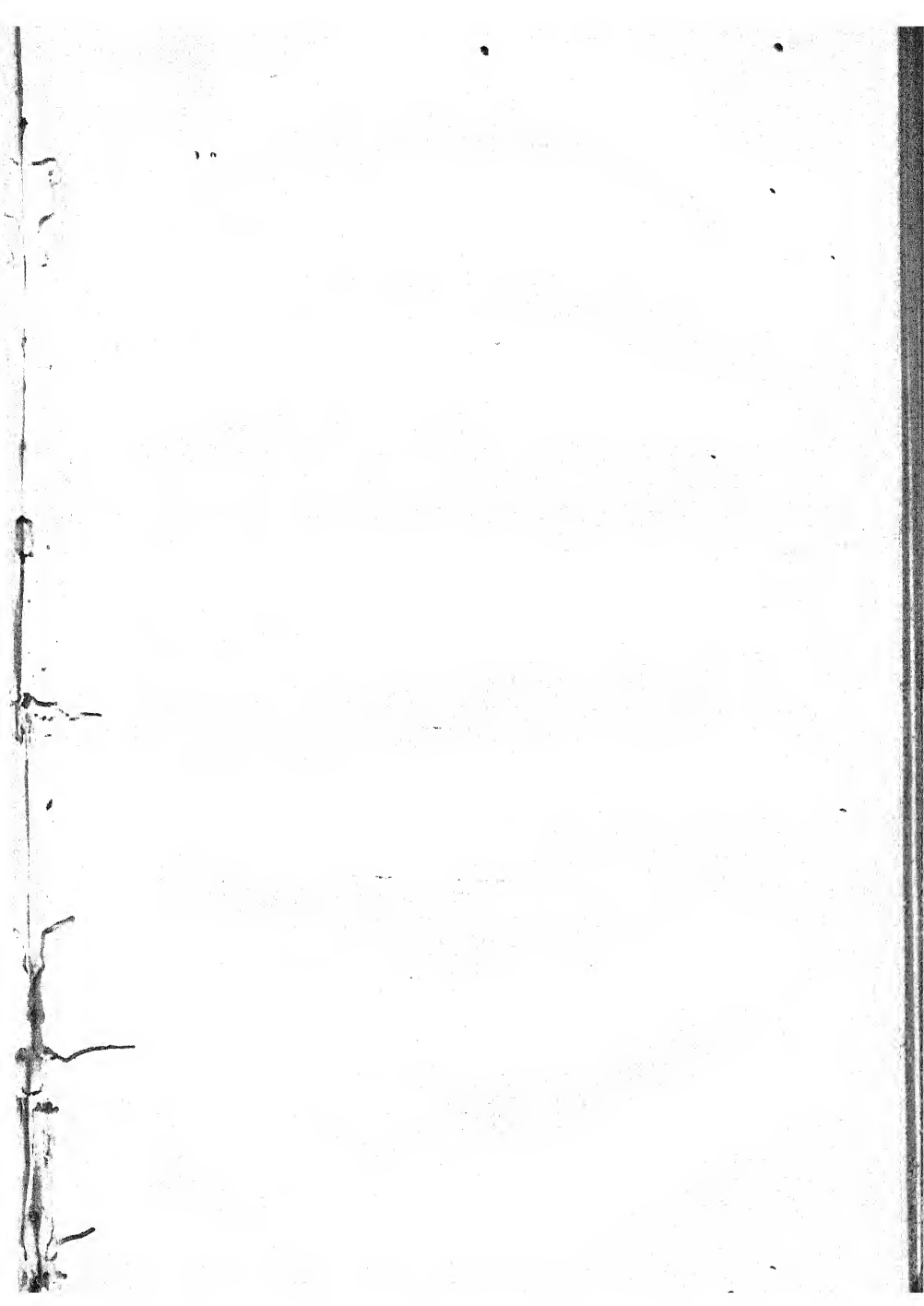
A description of a model of a new invention.

"Suppose, first, two pistons, with a toothed wheel between them, as in the common air pump; upon the same arbor, a second toothed wheel of the same number of teeth, with a plate of the thickness of the wheel between the two, to keep them separate; which plate is to be less in diameter than the wheels, by the depth of the teeth, (or it may be one wheel, only in the thickness equal to thrice the toothed piston bar,) and above the wheel which does not work the Piston, another plate is to be fixed, which is to be equal to thrice the wheel."

"In No. 1, Plate VII, ab and cd are the two wheels; fe is the first plate equal to ab in thickness, gh is the second plate, equal to thrice ab , and ik is the arbor; but ab and cd and fe , may be one thick wheel, equal to the thickness of ac . Two such wheels, and two such plates, are to be fixed on another arbor, which is to be long enough to carry a winch at one end, and a toothed wheel of eight diameters of the little ones, for keeping up the motion by means of a pinion and fly, which are to be on the outside of the machine."

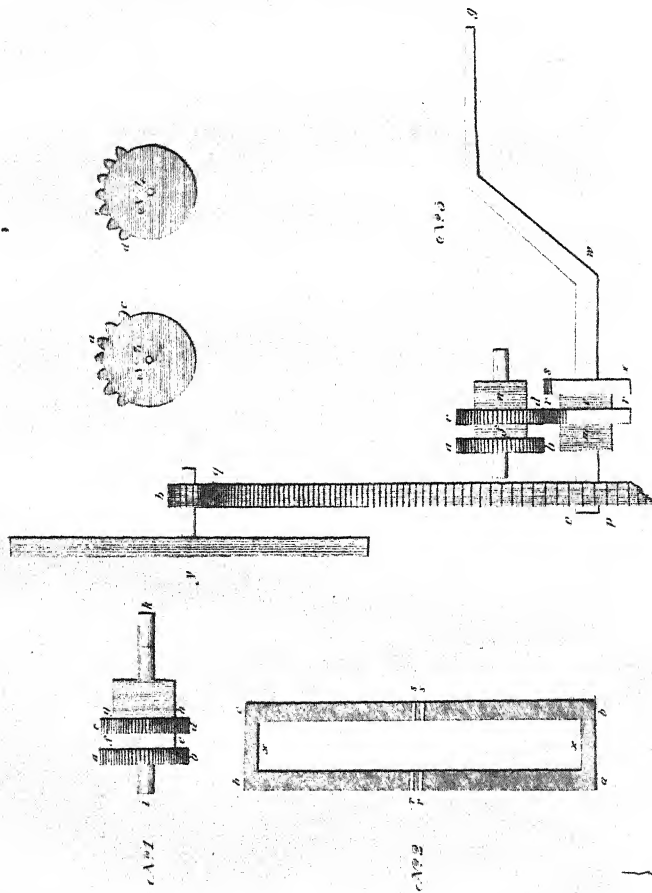
To one toothed piston, fix another of the same num-

* Mr. Stewart took out a patent for his invention.



*Colt's Patent for working pistons by a power
moving in a continued circular motion*

PLATE 3.



ber of teeth parallel to it, with the teeth of the one A. D. 1782. agreeing with the teeth of the other, and let the distance of these toothed bars, be equal to thrice the thickness of the little wheels."

"In No. 2, ab and cd , are two toothed bars, each as thick as one of the wheels, x the interval between them, equal to thrice ab , or cd , and rr , ss , are teeth exactly opposite to each other."

"The wheels that are fixed on the long arbor, have part of their teeth cut away. The wheels of my model had all 21 teeth; the two first described, retain all their teeth, the lowest or first of them works in the teeth of the pistons on each side, and moves them contrariwise; the second on the same arbor, is placed exactly in the middle of the interval between the toothed bars of the double piston, and consequently is entirely clear of the teeth of both; the wheels of the second arbor, had each 21 teeth, of which are cut away 14; as shewn in Nos. 3 and 4."

"When fixed on the arbor the tooth a No. 3, is to agree with the tooth d No. 4, and c with r ."

"No. 5 represents them as they are fixed in the machine:* ab is the first wheel which works the two pistons, one on each side, as in the common air pump, cd is the second or middle wheel of the same number of teeth, f the separating plate, and the steadying plate, rt is the third wheel, of which fourteen teeth are cut away, the teeth that are left, work in the teeth of cd , and turn it round in a direction contrary to the motion wg ; m is the steadying plate, v the separating plate, and sx the

* The Pistons are not shewn in the engraving, as they would have concealed the wheels ab and sx from view.

A. D. 1782. last wheel which has seven teeth. When the last, tooth of $r t$ quits the teeth of $c b$, the first of $s x$ takes into the teeth of the upper bar of the double piston, and gives it a motion contrary to that which it received before. $p o q$ is the toothed wheel that turns the pinion b , of the fly y . The backs of the piston bars, ought to work against rollers, to prevent friction, and to keep them always close to the teeth of the wheels."

"If instead of being straight, the toothed bars of the double piston, be parts of the arch of the lever of a steam-engine, then by the motion of that lever up and down, the teeth will work on the teeth of $a b$ always, and turn it backwards and forwards; when the teeth of $c d$ meet those of $r t$, they will turn the winch through half the circle, and when they cease, the lever in its contrary motion will act upon $s x$, and move it through the other half of the circle, and the motion will be always the same; therefore if $w g$ be a wheel instead of a winch, it may by a steam-engine be worked, and give motion to a mill."

"Rough as this description is, it will give a very clear idea of the machine, and if I had time, it should have been better drawn, and described in a more mechanical manner, but I have no instruments here."

"I hope the two Models will reach you, which I sent by different ships, this is the third. When the Models reach you, will you do me the favor to present one to the Royal Society, for it is certainly a very simple application of the power of the steam-engine to turn a mill, and to myself it is quite new. The thought struck me in consequence of the want of fire-engines, and my being desired to make one, when it occurred to me

that the natives would better manage a winch moving A. D. 1780. always one way, than a lever moving alternately up and down, as in common engines."

"I am,

Dear Sir,

&c. &c."

It was necessary to make up new, the greater part ^{New camp} of the camp equipage and stores, required for the ^{equipage} equipment of Colonel Pearse's army, a sufficient supply ^{required.} in a serviceable condition not being in store.

During the delay in preparing these, and while waiting the final instructions from the Supreme Government, several letters passed between Colonel Pearse, and Major Edmonstone, who was second in command, and had proceeded with the army to Midnapore.

In one of these letters, Colonel Pearse writes the following paragraph, and if the spirit of it was acted up to generally, there is no doubt, but that *Camp Followers* would occasionally prove an useful defensive force. The other paragraphs which follow are not without their interest as Historical Records, &c.

Fort William, 4th December, 1780.

"As I wish every man in camp to be armed with a Col. Pearse
spear, and distinguished with a plate of brass, copper, ^{Arms all}
or other metal, with the name of the officer, or other ^{camp fol-}
European or Native to whom each individual belongs; ^{lowers with}
or of the Battalion and company, if to the Sepoys, or of ^{spears, &c.}
the Battalion and bazar, if to the followers, I request
that you will give the necessary orders, as it will take
some time to get them ready."

"This is intended for the security of the people, baggage, and bazar; with such assistance as we can spare."

A. D. 1780. "We shall be permitted to entertain an hundred Mogul Horse, if we can get them with horses, if any should offer, pray let me know their numbers, and whether their horses are fit for the service, and so far engage them, that when the order is passed, they may be embodied."

"Such very extraordinary reports are circulated here concerning Captain Grant's Battalion,* that though from your total silence on the matter, I am led to conclude, either that they are groundless, or extremely exaggerated, yet, as it is of high importance to the service to be more fully informed, I request you to let me know as many particulars of that affair which it is said did happen, as came to your knowledge."

"I am,

Your most obedient Servant,

(Signed) I. D. Pearse."

In a subsequent letter to Major Edmonstone, Col. Pearse writes as follows:—

"17th December, 1780.

"I am very happy to have my mind at ease with regard to Captain Grant's Battalion, for the reports that did prevail, filled me with most disagreeable apprehensions."

"The camp equipage is surveying to-day, to-morrow, and the next day; whatever is fit to be received will be embarked, and sent off under Lieut. Gooch, who is ordered by General Stibbert to proceed with it by water to Balasore."

*This Battalion committed many acts of insubordination, and shewed such an unmilitary spirit, that it was reduced, and the Native Officers discharged from the service. Captain Grant was also dismissed from the service, by the sentence of a Court Martial.

“ I wish to leave this place, but I am detained for my A. D. 1781. final instructions, these depend on news from Nagreepore, so that though I wish to go, I must be patient.”

“ A company of Golundauze is added to the detachment, and formed; the Horse will be granted, and the order passed.”

“ The Governor General sent an express to you to-day, apprising you to be on your guard, as Chinnagee has crossed the river with his whole army; yet he wishes not to spread alarm.”

“ I am still of opinion that the Mahrattas are not our enemies; but such an armed force must be watched; more especially as there is a lad of about 20 at their head, and he is head-strong and violent; it is true he has a man of experience and abilities to assist him, but there is no knowing what he may do.”

“ The rabble in Cuttack, will certainly never dare to look us in the face; the very attempt may cost them dear, and I hope my instructions will be positive as to the thing to be done, discretionary as to the mode, with licence to act according to circumstances.”

“ *Fort William, 21st December, 1780.*

“ General Stibbert apprised me, that the Mahrattas have advanced towards Balasore, and were within 15 Coss of it; if you should hear of their attempting to attack Captain M'Pherson, or entering the provinces, it may be necessary to make a motion with the whole detachment, to be at hand to support him; and in case of such an event, unless you should receive orders from hence to the contrary, I recommend it to march the whole, rather than to divide the detachment by sending away a part of it.”

A. D. 1780. "After all the delays and trouble experienced by Col. Pearce, it appears, that the new supply of camp equipage was made of very inferior materials, and of a different pattern from that established by Sir Eyre Coote. Two letters appear upon this subject, addressed to Mr. Hastings."

The new
camp equi-
page proves
bad.

*To The Honorable Warren Hastings Esq.
Governor General, and the Board of Ordnance.*

"Fort William, 15th December, 1780.

"HONORABLE SIR, AND SIRS,

"I lay before you, a report of the camp equipage, received by the Quarter Master General of the detachment under my command. None of the tents are made agreeable to the pattern approved of by Sir Eyre Coote, and I should have returned all of them that are inferior in quality to those which have been hitherto delivered, but that the necessity of getting ready, obliged me to keep them such as they are."

"Permit me to say, that the same must be expected on every future occasion, unless you should be pleased to order every corps to be complete, and the commanding officer thereof responsible that it is kept so; and also to have a reserve in store to supply occasional wants."

"I am,
&c. &c."

*To The Honorable Warren Hastings Esq.
Governor General, and the Board of Ordnance.*

"Fort William 9th January, 1781.

"HONORABLE SIR, AND SIRS,

"I think it a duty incumbent on me, to lay before you the two accompanying letters, from the officers of the detachment under my command, complaining of the badness of the camp equipage."

“ These letters most fully support the report of the A. D. 1781. survey which I ordered to be made here, and submitted to your consideration, so that if there were any doubts, they will now I trust be utterly removed.”

“ I am,

Honored Sir, and Sirs, &c. &c.”

To Major Edmonstone.

“ Fort William, January 7th, 1781.

“ DEAR SIR,

“ I have the pleasure to inform you, that I shall set out for camp to-morrow at ebb, and should have taken my departure this night, if my tents had been ready. I shall proceed via Gongacolly.”

“ Be so good as to carry the orders of the Board into execution, as far as you can, that no time may be lost; particularly too, that the native officers of Grant's Battalion may be sent off, as soon as possible.”

“ Stibbert says, there are no more elephants at Plassey, or none fit; the english of which is, that we shall not get any more in exchange; so we must look out for camels, if to be had, or elephants I will hire as soon as we get over the River.”

“ We shall have some days to halt yet, as the instructions do not accompany me.”

“ I am &c.

T. D. Pearse.”

Col. Pearse left Fort William early on the 9th, and on the 11th January he joined the army in camp near Midnapore, whence he writes to General Stibbert.

A. D. 1781.

*To Brigadier General Stibbert.**"Camp, near Midnapore, 12th Jan. 1781.*

"SIR,

Col. Pearse of my having taken charge. To day I had the pleasure to
 joins his see the troops, and had every reason to be pleased with
 Army at Midnapore. so fine a body of men."

"Our elephants are really not adequate to the camp
 equipage: one died last night, and two or three others
 are in a bad state; I have ordered a survey, and will
 transmit it to you, and hope that you will be pleased to
 order others."

"We shall need some more tents for the Field officers;
 the things that were sent down are indeed most wretched
 ones, as the last reports will certify."

Endeavours for themselves; indeed it is much to be wished that it
 to procure, were made general through the detachment, immediately
 tent allow- as to carriage, and hereafter as to tents; but it will be
 ance for necessary to fix only six months for the Captains and
 Officers. Subalterns tents, instead of 18, as the regulations di-
 rect; and if it be well authorized, every body will be
 well provided in a very short time, for all seem equally
 desirous of it, as they are now not sheltered from the
 weather."

"I am Sir, &c. &c."

On the 14th January Col. Pearse addressed the fol-
 lowing letter to Mr. Hastings:

.. To The Honorable Warren Hastings Esq.
Governor General.

A. D. 1781.

"Camp, near Midnapore, 14th Jan. 1781.

"SIR,

"I beg leave to trouble you on the subject of the train, which I am now more fully persuaded is not sufficient for the detachment; permit me to observe, that when the detachment was first talked of, and previously to its being ordered, I gave in a list of 16 six Pounders, 4 twelve Pounders, and 4 Howitzers, which I then assured you, I conceived necessary for us. At that time it was only to consist of 6 Battalions, and proportion being made according to that number, only 12 six Pounders were allowed me; the change on the establishment now gives me 10 Battalions, and according to that proportion, 20 six Pounders are become necessary, admitting precedents to be drawn from what has been customary; if these be allowed, I shall have precisely the number of ordnance I first asked for, and I give you my word, that I do not think the number too great, but deem it necessary for the good of the service, that we should have them."

Complains of the insufficiency of the train.

"Give me leave further to observe, that when Col. Leslie went, I observed the same proportions. I proposed 4 twelve Pounders, and 4 Howitzers, besides his Battalion guns; the four former he had, but only two of the latter, because there were no more at the station; accordingly he marched with 12 sixes, 4 twelves, and 2 Howitzers; these he found insufficient, and after the attack on Mowe, he carried with him all the guns that were fit, which were taken from the enemy."

A. D. 1781. "If it be objected that it will lengthen the train, I admit it; but must observe, we already have the Bullocks, and that the total length added, will only be that of 8 guns, and 10 Tumbrils, in all 200 feet, the guns and Tumbrils; these and their ammunition are ready, and only want to be sent for."

"I need not say Sir, that we may expect to be opposed by very numerous bodies of horse and foot, with well appointed trains, and that the stress of the action must be on the Artillery; because, as Hyder Ali has a very large army, and will, I conceive, use powerful means to prevent the junction of so respectable a detachment, the thing is self-evident."

"Opposed as we shall be by horse, the safety of the army will require two lines, and guns with each; and whether we attack or defend, our fire of Artillery must of course be very weak; on the contrary, with the train I humbly ask for, and I hope you will grant, I think our fire will be superior to any thing he can oppose to us, and without presumption, may flatter myself with success proportionable to it."

"I therefore take the liberty of inclosing an indent, for 8 more six Pounders, and 10 Tumbrils, with ammunition in proportion, and with a small addition to the Musquet ammunition."

"Some more camp equipage will also be wanted; that I have sent to the Board of Ordnance, as it is not a matter for your consideration, being only a necessary consequence of change of establishment."

"I have the honor to be Sir,
Your obedient and humble Servant,
T. D. Pearse."

On the 21st of January 1781, Col. Pearse received orders from Mr. Hastings, to commence his march towards the Soobanreeka, but not to cross until he received further instructions.

A. D. 1781.
Col. Pearse receives orders to march.

The army in consequence, marched on that day from the Midnapore camp, to Carruckpoor, a short distance off, at which place, Col. Pearse was obliged to halt a few days for supplies.

Major Edmonstone was second in command, and Major Blane the third officer in rank in the army.

Major Grant, whose Battalion (the 20th) had been disbanded, was directed to remain at Midnapore, until final orders from the Commander in Chief or Supreme Council arrived concerning him.

Previous to marching, and on the march, a great number of the Sepoys deserted from the army, especially those men who had formerly belonged to the 20th. A Court of Enquiry, and subsequently a Court Martial, was held upon several of the deserters who were taken prisoners, and the cause of the frequent and serious desertions, was as far as practicable enquired into. Several of the ringleaders were sentenced to suffer death, but Col. Pearse was very reluctant to enforce capital punishment at the time, as appears from the conclusion of a letter to General Stibbert, Commander in Chief in Bengal.

Desertions from the Army.

"I find that sentence of death is passed on some. Though the example is so necessary at this juncture, I confess that nothing but a positive order from the Board, will influence me to carry it into execution. I must approve the proceedings, and for this reason, though I shall approve and sign, I shall wait for the

A. D. 1781. Board to fix the punishment that I am to inflict ; and indeed I recommend it to them to be pleased to approve of a general pardon, since a sense of honor is a principle, which when once fully established, will make our army perfect, and I do not doubt but that the present regulations will most fully establish it."

"It is my opinion of the natives of thiscountry, that they are soldiers at heart,* and may with proper management be made as fine soldiers as any in the world."

"The army reached Muchurumpore on the 28th January; Hutnagur on the 30th, and Dantoon, on the 31st."

On the 2nd of February, Col. Pearse writes to Mr. Hastings as follows:—

To the Honorable Warren Hastings Esq.

"DEAR SIR,

"The receipt of your orders, and the explanation has given me the greatest happiness, the line of my conduct is so clearly drawn, that I have no doubts to trouble me; but the provisions, are to me, as to every other person in command, a severe trouble. I have renounced all emolument from the bazar myself, and will not let any body else receive any. Yet some small duties must be collected to pay for the persons who superintend the bazar, and the collections must be sufficient to defray the expense. Whatever may be collected shall be reported to me, and an account regularly kept, which; as I declare I ask no benefit, I shall be ready to lay before the whole world. The trouble I shall take, I see will be very great; be it so, I am devoted to the service

* Of course Col. Pearse alludes to the Natives of the upper Provinces, who were generally speaking, the only men enlisted as Sepoys.

I am going on, and I will perform it if it be possible, and A. D. 1781. my labors day and night may complete it. I enclose you the orders I have been obliged to issue already, by which you may see what is likely to happen ; for, if with every assurance of protection, I cannot get necessaries for money, and within the Company's provinces am obliged to send out foraging parties, what am I to expect elsewhere? doubtless there will be complaints, and you will hear of what the people call ravages; but when the orders I have given are before you, you will see the necessity I am driven to. With respect to the Bullocks, before I received the orders of the Board, I had sent away the hired ones, and have now ordered all the rest away, except such as may be indispensibly necessary ; to what cause it is to be attributed, I do not exactly know, but the fact is, the Midnapore Battalions had no Bazars worth a cowrie as to the uses of an army; those that came from Berhampore were tolerably well off. We have had rain in torrents here, and are knee-deep, to day it has gone off and we are drying again. By the orders I have given about musters, you will see I have struck the evil at the root. I have mustered in the form, but it was such miserable weather that all was not regular; besides it was new, and therefore not so well performed as it might be and shall be hereafter. If these orders are not followed up by a regulation of Government to the like effect, I shall be deemed a Devil, so I hope to see the regulations. I sent a copy of them to Stibbert, for I am aware there will be applications to him, I know the practice of subsistence was general; to have forbid it here, would have only created discontent, and perhaps desertion, so I continued it by order, under

A. D. 1781. regulations subject to the orders of Government; thus
 • I have put every Sepoy in the way of knowing his rights,
 which were always hidden before by every art. I will
 • a/ set to work with Kennaway's assistance, to do what you
 desire, but it cannot be done in a day."

"I am &c.

*To the Honorable Warren Hastings.
 Governor General &c. &c.*

"DEAR SIR,

Umbrage
 taken at
 Col. Pearse's
 attempt, to
 correct
 abuses.

"I find it has given some umbrage, that I counted the
 files of the Regiments, for it is asserted, that now officers
 sign upon honor, which was not the case before, and
 those who have the payment have no possible emolu-
 ment from false musters; admit the principle, the conse-
 quence is, that the appearance of the commanding officer
 of the troops on the parade is useless, and he can never
 muster the troops under his command at all."

"But what is still worse, the Major must never examine
 his Regiment, nor the Captains their Companies; so that
 all checks will be destroyed, instead of established.
 However, as I do not wish to do any thing to hurt any
 soul living, but I must and will know the strength of my
 little army, by ocular proofs: pray, let the modes of
 muster be prescribed in such a manner, that there may
 be no offence taken; but this I plainly tell you, you
 must not trust any man's honor who has a possibility of
 playing tricks with your troops, because the whole may
 be lost, and every man's honor buried with his body in
 the general ruin that must follow having an army on pa-
 per only. Suppose a bad man at the head of a Regiment,
 the Recruits under him, and he their paymaster, as was

wanted, who could check him but the Commanding A. D. 1781. officer? Suppose the files are not to be counted by the Commanding officer, that there is no Major, and only one Subaltern in each Battalion, (a case possible) what is to be the check if the Commanding officer is not to count the Files? It would be impossible he could stand to hear the Roll of each corps called over, and yet if he does neither, he cannot be said to muster the troops. There is indeed one mode of making the troops march before him by fours, or sixes, in which case he may see them, and count them also; and it will have this good effect, that it will shew that the people can march, and therefore would answer a double purpose, but it would be tiresome and tedious to the troops and the reviewing officer, and therefore ill done, I mean with a body no larger than the one I have; if done only at different times, it might as well be let alone altogether; all this passed in my mind before I gave the order that I sent you yesterday, to-day I hear it gives umbrage, and therefore beg that the mode may be settled before the next muster. I march to-morrow part of the way to Rauegaut, the next day I shall reach that place, where I shall wait for the drafts, and the day after I get them, I shall set off."

"I am &c. &c.

On the 6th February, the army reached Jellalore; on the 9th crossed the River Soobanreeka, and entering into the Mahratta Territories, encamped at Rauegaut, on the south bank of the river.

The crime of desertion had as yet been treated with lenity, but so seriously was the army weakened by the repetition of it, that Col. Pearse found it necessary at this place to make a public example of a deserter, by

A. D. 1781. blowing him from a gun; which circumstance he relates in the following letter to Mr. Hastings.

A deserter suffers Capital punishment. "I was forced to blow a Deserter from a Gun this day, that it had great weight I conclude, from the dead silence that prevailed."

"I hope it will put a total stop to desertions, the man had no excuse, he delivered 32 Rupees to me for his family; he was tried at the Drum Head, in the centre of the troops paraded for the purpose, and executed on the spot: my feelings very nearly made me say pardon, instead of giving the signal, but this is not a time to give way; so I laid aside the man, and let the officer prevail."

"I am, &c. &c.

South Bank of the Soobanreeka 10th February 1781.

On the 11th, the army reached Bustah, and on the 12th Ramchunderpore, at this place Bissember Pundit, paid Col. Pearse a visit in his camp, which circumstance is thus detailed.

To The Honorable Warren Hastings, Governor General.

"DEAR SIR,

"Bissember Pundit, came into my camp to day, just as the advanced guard arrived; I found there were spies enough, and as attempting to conceal any thing would have been betraying fear, I let the whole march whilst he was sitting with me."

"Chimnagee has been making long marches towards the high road again; he was about 16 miles west of it, when the Hurkarruh who wrote the inclosed came away. He seems to threaten to enter Bengal, but I believe he will not come near us. I have written a letter proposing friendship, and a desire to pass peaceably through

the. Maharatta dominions, and assuring him that if any A. D. 1781.
cause of dispute arises between the armies, the fault shall
not be mine; that all I wish is, to pass peaceably to Ma-
dras, to which place, by the orders I have received from
the Council, I am bound to proceed, and that I desire
he will give orders to prevent them, as I on my part
will do. I shall send a copy of my letter to you as soon
as it is translated. I punished with much severity, before
Bissemer Pundit, some people who had destroyed a
chopper; he had heard I had done the same at Bustah,
and he saw how carefully I posted safe guards every
where, this must convince him we are friends till made
otherwise. I desired he would send to the Rajah an
account of what he saw. I saluted him with 11 Guns
out of respect to Chimnagee, as he goes with a com-
mission from him. Mr. Anderson accompanies him.
This is the first day, I have felt fatigued."

On the 14th the army arrived at Balasore, whence Col.
Pearse writes the following letter to Mr. Hastings.

To the Honorable Warren Hastings Esq.

"Camp near Balasore 14th Feb. 1781.

"SIR,

"I have the honor to inform you, that I arrived at this
place about 12 o'clock, after a very fatiguing march, for
though the distance was only 11 miles, by reason of the
swamps we met with in the way, we were no less than
nine hours in performing it. It appeared to me, to be a
matter of so much importance to get to Balasore, that
I was determined to push on, as my future supply of pro-
visions depended on it. I had heard that Chimnagee
was in full march this way, and though in the Jungles,
still I reflected, that as he was four days ago so near as

A. D. 1751. Jauzepoor, had he been active, and desirous of preventing me from getting provisions, he had only to push on, and take post at Balasore, and oblige me either to submit to the danger of starving, or come to extremities to get victuals for my troops. The former would have stripped me of half my army, the latter I knew it was the desire of yourself and the Council, that I should avoid by any honorable means, and therefore getting to Balasore, before his army, was what answered every purpose. I acquainted you that I had written to Nana Row, the Phouzdar of this place ; in consequence of my letter, he returned post to his Government to meet me, and this evening I have had the pleasure of an interview. In order that I might avoid paying more compliments than I supposed he was entitled to, I fixed on an hour after sunset for his coming, and besides I was so fatigued, that I could not have paid proper attention to him, till I got a little refreshment. He came about eight o'clock, and his attendants were stopped by my pickets, which I was glad of, as it shewed that though we proceed like friends, we still keep on our guard. He left his horsemen on the other side of a small Nullah, and came on with his foot attendants. I received him at the tents, and after having discoursed about provisions, he desired to retire with me, which was accordingly done. He asked me what I had written to Rajah Ram Pundit, for he knew I had sent a Camel express, I therefore shewed him a copy of my letter ; he was much pleased : he told me that Rajah Chimnagee had expressed a great desire to see Mr. Anderson, but that he could not persuade him to return ; I told him, it would have been to no purpose if he had, for that Mr. Ander-

Visit of
Nana Row,
to Col.
Pearse.

son was charged with a Commission to apprise the A. D. 1781. Rajah of our march; but not having got sight of the Rajah, who was shut up in the Jungles, he had sent his letters on, and in obedience to the orders of Council, was returned: that after receiving such orders, had he gone to the Rajah, it must have been a fruitless visit, for that he could not have said more than his letters contained, and these he had sent. He agreed that the reasoning was good, but begged I would write to desire from him, on the part of the Rajah, that a person of confidence might be sent to confirm the amity, and that if such person was sent, he was persuaded that amity would be firmly established. I promised to inform you of what he said, which gave him great satisfaction. He asked me, if I was going to Madras, I told him it was all I wished, or had orders to do, and that it should not be my fault, if I did not go on as I had begun, as the closest friendship between the English, and the Rajah of Behar, was long established, and it would be a subject of much pain, if ever it should be broken: we had experienced the effects of a like desire, on the part of the Rajah, and were sincere in ours. He said, the Peishwah had sent repeated orders for him to join, and act against the English, but hitherto without effect; I said I was fully informed of it, and very happy that the amity had never been broken, that the urgency of our affairs had made the march necessary, but he saw plainly, from the care I took to prevent mischief from any part of the army, that I had orders to proceed like a friend. He said his master would incur the displeasure of the Peishwah, for adhering to us: I told him in reply, that I hoped peace would soon be established between him and the English, that the fall of

A. D. 1781. Basseen would, I hoped, be the means of effecting it speedily; and in that case, he would be pleased that the Rajah had not joined against us. He asked me in very pointed terms, if I had heard any thing from the coast; I told him, I had heard there had been an engagement between part of the army under Hyder Naig, and the English, and that his son was killed: he turned it off, and did not absolutely deny it, nor admit that it was true. I told him a force was arrived from Europe, and that our army had taken the field: he observed, that we should be late, and that the rains would be beginning before we could arrive. I said, we certainly should suffer from the heat, but should be there long before the rains. This was all that passed on politics, except that he asked, if the French had joined Hyder. I told him, they neither had, nor could; for our ships would prevent it, that it was my opinion that the French never intended it, or if they did intend to do so, it must have been before they were driven out from India, and that now they could not do any thing of consequence; for even supposing that 2 or 300, should ever escape our fleet, they would be no real strength, for we had received much greater numbers than they could possible send, and had more coming. The rest was only about provisions, which he promised to let me have; and Mr. Wadsworth told me, he had collected 6,000 maunds of rice, that was ready. In his last visit, I presented him with pawn and beetle, and promised to return his visit to-morrow: what passes at that interview, if in any way different from what I now relate, I will immediately communicate:—thus far I wrote last night. To-day my Hurkarruhs brought me word, that the night before last, Chimmagee marched from his

encampment near Jauzépoor, with 2000 chosen men ; A. D. 1781. and marched away ordering his followers to come after him ; he had given out, that he was going to Balasore to meet me, but his soldiers say he marched to engage : this is more probable, as I have not heard, a word from his camp, as I conclude, I should have done, if he had intended a visit : he took two days provisions, so that if Balasore was his destination, I must hear of him to night, and friend or foe, I have prepared for his reception. I send away the proceedings of the Court Martial to day. Yesterday Lieut Skinner returned to attend the Court Martial on Major Grant ; he tells me, that Captains Bruce, and Knudson, are two others who will be as necessary. The proceedings of the enquiry will shew, which of the native officers have most to say : however, Lol Sing, and the Commandant, the Adjutant, and the Havildar Major, can give full information of every thing else, but you have the whole set at the Presidency."

" I am &c. &c.

On the 16th, the army halted near Esthiapore, hence the following letter is dated.

To Warren Hastings Esq. Governor General.

" Camp east of Neelgurre hills, 16th Feb. 1781.

" SIR,

" I am passing through a country as little known, as if it were in the midst of China. We always understood that the whole country was a wilderness, from Jellasore to Balasore. My march lay to the end of that wood, through plains so extensive that I saw the sun rise from a fair horizon, and I found the country in the highest state

A. D. 1781. of cultivation. We followed the bullock road, by the track of their feet, they must have passed in thousands to have beaten it so much, to the southward of Ramchunderpoor. We marched due west, to get to the ford, which we passed at low water, with only 18 inches : at full tide there are 15 feet. To-day, we set out through a plain, with as fine a road as any army could wish to find, but the plain was only a mile and half long, from thence the road lay through a town, and a wood extending a mile ; there we again entered a plain, and I hoped our troubles were at an end, but it was only about a mile across, the rest of the march was through a close wood, so thick we could hardly move along ; in short, we were six hours going six miles, and having passed two Nullahs to get to the place where I am, we were obliged to halt. Tatar Rhawn, with 10,000 men, lies just behind the Neelgurree hills, on our right, which is west from us. Dhumdurea has a body of about, 16 or 20,000 more ; and he is before us, where, I cannot say, however, in spite of all the assurances of Chimnagee, we may very likely come to blows ; and though I will never break your orders, yet I do heartily wish to hear half a dozen Rockets, that my orders may be set aside : as for Chimnagee and Rajah Ram Pundit, I believe, they are sincere in their professions, but those I speak of, are the Poonah Chiefs; and report says, they will attack, so you may probably hear of us, as we all wish ; for whilst all others are gathering Laurels, we are only marching in the heat of the sun. I do not pretend, from seeing a narrow strip of a country, to judge of the whole of it ; but I do think, from what I have seen, that it would, in the hands of our Government, be a valuable Province.

It would at least pay for its defence, by which our settlements would be connected, and our boundaries further removed from places, which are subject to alarm from the vicinity of the Maharattas. I verily believe, if they do strike a single stroke at this army, that every body will then wish to help us, not that I covet such assistance.—After such a statement, only consider what I must feel should we be attacked, that afterwards I must leave Cuttack in their hands; but in such an event, I hope the exercise of a little discretion will not be considered as a crime, since the world will judge from facts, and not from my orders, which they may never see or hear of: possibly after all, there may be no occasion for any remarks of mine.”

“ I shall be nine days more, getting to Cuttack; perhaps I may hear from you before I reach it, if any thing in this letter should seem to be worthy of an immediate answer.—Rajah Ram Pundit, has answered my letter with professions of friendship, and thanks for the good order I preserve in my march, which certainly proves, that I mean to pass as a friend; but still they know that I go ready for war at all points.”—

“ I am &c. &c.

From Bigoneah, the next halting place, Col. Pearse writes to Mr. Hastings, and to General Stibbert.

To the Honorable Warren Hastings &c. &c.

Bigoneah, 17th February 1781.

“ SIR,

“ I had the honor to receive your letter of the 13th instant, yesterday about 9 at night, too late to answer it as we were to march at 4 the next morning, and I was fatigued as well as the troops, by having been on the

A. D. 1781. road from five in the morning, till past eleven, and the rear guard passed my tent at 4. Yet the march, as I told you in my letter of yesterday, was only six miles, but the difficulties we had to encounter, are inconceivable to all who did not witness them. To day we marched at 4, and I intended to reach Surong, being told we had only 6 Coss to go, which, as I understood it, was but 12 miles. At 8 o'clock the advanced guard reached the place of our present encampment; here, expecting to learn that Surong was just at hand, I learnt that it was 4 Coss distance, and that we had travelled somewhat less than 2 Coss, by the actual measurement we travelled 8 miles and $\frac{1}{2}$, therefore according to the country mode of estimating, we had 4 more such Coss to travel; (as we had marched 2) that is 16 miles; it would have killed all the cattle to have attempted it, for we could not have found a halting place, with water sufficient for us, nearer than Surong, and only one plain capable of containing the army, and that quite destitute of water. Such was the information I received, the truth or falsehood of which, I shall judge of to-morrow."

"I am thus particular to shew, that I make all the haste that the country will permit me to do. I so fully enter into all your views, with respect to this Government, that you yourself cannot be more anxious than I am to pass on peaceably; for I conceive, that if I am able to accomplish it, and indeed I expect it now, (as the people come with grain and sell it cheap, and freely to us,) the peace between the English, and Mahaujee Boosta, will be established on such a firm footing, that I should rather expect to hear Chimnagee had received orders to join us, than to attack: still however, I keep

on, my guard, and will do so, for I well know, that peace A. D. 1761.
may be more easily established by preventing the probability of a successful war, than by battles gained. From your last letter I think you expected to hear of my being at Rauegaut, waiting for something: never was any thing further from my thoughts, my desire is, to get to the busy scene, and join General Coote, or act under his orders against the enemy. I feel very much, that at present I have nothing to encounter, but heat and bad roads: could we have passed without any Artillery, to be sure we could have marched faster, for all the roads are very fine for foot passengers, and so you will hear; but people who walk straight forward, on their own business, seldom take the trouble to consider whether an army could travel as they do, or not; and all are not qualified to judge, because it is a subject which has no kind of connection with their occupations, and consequently has not a place in their minds; but if a judgment is to be formed by such persons, doubtless the motions of an army must appear very slow, and the commanding officer will be loaded with censure. To me it is a matter of perfect indifference, because I am certain you will not give ear to such observations."

"Last night Nana Row sent me a letter from himself, and another from Rajah Ram Pundit; the latter expressing his satisfaction at the accounts he hears of our peaceable and orderly progress through the Country, and the great care taken to prevent mischief: the former tells me, he will send a confidential person to accompany me the rest of the journey through the district, and expressing the desire of the Rajah, that I should not cross at Cuttack, but at another place he

A.D. 1781. mentions. I wrote to both : to the Rajah that all routes were indifferent to me, my desire was to pass on to Madras, and I would cross either above or below Cuttack as he pleased, if he only would be kind enough to send somebody to shew me the road, and order boats, if necessary to pass us across the river, as well as a regular supply of provisions."

"I told him that I was very happy to find that our method of marching gave satisfaction, he might be assured that I should continue it."

"To Rana Row, I wrote word, that it was much my desire to have a confidential person of his Government in camp ; and that I would order every thing in my power to make his abode amongst us as comfortable as possible. I begged him to forward my letter to the Rajah, as I supposed that his conveyance would be quicker than mine. It was reported to me yesterday, that an officer's baggage had been carried off, by some plunderers from the camp. I disbelieved it at the time, but as I had seen some straggling horse, I thought it was possible, more especially, as I find it an endless labor to keep the baggage in its place, and in regular order ; in consequence, I ordered that if any straggling horse should again attempt to carry away any part of the baggage, the nearest guards should fire a few single shots at them, to keep them off, at the proper distance. I sent word of it to Nana Row, and told him, these horsemen were as much enemies to the Rajah's army and country, as to mine, and that I had therefore ordered them to be fired at, if they repeated their attempts. I keep my Pickets out, first to prevent mischief, secondly and chiefly, to instruct the young officers and men, in their duties,

that, when we really want to use them, they may know A. D. 1781. what they have to do. I also oblige them, for the same reason, to march by secret signals, in silence, and give out, that I do it to prevent giving notice to the plunderers; thus I hope to lay the foundation of that discipline, which will be necessary when we have a real enemy to deal with, and by degrees we shall get things in the order I wish. To you all this is very intelligible, you know that two thirds of the officers never marched with an army at all, and not one fourth of them ever saw an enemy."

"Excuse the long detail of matters that may seem foreign, I take the liberty to declare the whole to you, because I dare say you will hear silly remarks made, and because I hear the whole town is in an uproar, in consequence of my not blowing from a gun the Jemadar, who had the sentence passed on him, and that they maliciously add that I have pardoned him, though he was convicted of having sent intelligence to our enemies: the very Commander in Chief by his letters to me, through his Secretary, seems to be in a mistake, and to censure me for what I did, by saying that he could have wished the first sentence passed on him, had been carried into execution."

"It was always understood in the King's army, that sentence of death cannot be passed on any man, in consequence of any act that subjects him to any one of the articles of war, in which the punishment is not expressly declared, to be *Death*.—Budloo Sing, could only come under the 4th article of the 5th section, in which the law deems, 'such punishment as shall be inflicted by sentence of a Court Martial,' and the word *death*, is not in it. If

Instance
of correct
judgment of
Col. Pearse,
in Military
Law.

A. D. 1781. any doubt remains about the article, the 1st of the same section explains it: for it says, 'any man guilty of desertion, shall suffer death, or such other punishment as shall be inflicted by sentence of a Court Martial:' but to put the matter beyond all doubt, let any person look at the 1st article 2nd section, where the sentence for an officer is cashiering, for a non-commissioned officer or soldier, 'such punishment, as shall be awarded by, &c. &c.' and the crime itself, is not capital in any one."

"I have just learnt that Chimnagee's parties, are all called in, his whole army re-assembled under his personal command, and all are gone further away from our route: one of his head spies was taken to day and brought to me, I told him to go all over my camp, if he pleased, I had nothing in it but what Bissember Pundit had told him of by my desire; that I only wanted to pass in a friendly manner through the country to seek for Hyder's army. He had a long discourse afterwards with my Jemadar, who fully convinced him, that such were really my intentions, and then in return, the Jemadar was told that Chimnagee had formed his excuse for the Poonah Government, alleging, that whilst he was engaged in the Jungles, our army had entered, and was so firmly in possession that he could not recover it, with the army he possesses; which he could not oppose with any probability of success, to an army so well equipped for fighting as our's. Besides, he had stated to Poonah, that his men were in arrears, and unwilling to go against an enemy without pay, which he could not give them."

"Though I believe all this really to be a fact, yet it will A. D. 1781. make no alteration in my conduct ; I shall continue my precautions, and still proceed like a friend."

"I am, &c."

The army reached Surung on the 18th, and Rana Julaub on the 19th, February; on the 20th the army halted.

On the 21st the camp was at Buddruck, on the 22nd at Jagepoor, and on the 23rd at Damnagur. In the conclusion of a letter to Mr. Hastings, written at this place, Col. Pearse mentions Chinnagee's having again approached him with his army, and reports were in circulation that he would oppose the further progress of the army at the Cuttack river. On the 25th the army was at Ramkinsunpore, on the 28th the army forded the Mahanuddee river and encamped on the banks of the Kiljury river, which runs on the southern side of Cuttack Island.

This part of the march appears to have been through a beautiful country, as Col. Pearse writes in a letter to Mr. Hastings.

"As we marched along the banks of the Beerpah, (where the army crossed a nullah by a fine stone bridge of 9 arches,) our eyes were gratified by the sight of the hills on the opposite side, detached like little islands, and valleys the delight of nature; in short, Sir, we have been travelling through the gardens of paradise; human nature cannot conceive a scene more delightful; nature seems here to have bestowed her beauties in wanton profusion."

*Description
of a beautiful
country
in the route.*

Col. Pearse, at this place, writes to General Stibbert Commander in Chief in Bengal.

A. D. 1781.

"Cuttack, 1st March 1781.

" SIR,

Report of
desertions
forwarded
by Col.
Pearse.

"To save time, I send the enclosed report of our desertions, and the number wanting to make up the loss; besides this, we have 273 in the hospital: consequently we have only 4,409 effective men. It may possibly be thought worthy of consideration, by what means we are to be re-inforced, and completed; for I apprize you beforehand, that I expect greater desertions to follow, which I have no means of preventing. I therefore submit it to your consideration, whether it may not be proper to recommend to the Board, to order drafts from the Sircar Battalions, when we arrive at Gangam; not that I shall either rely upon getting them, or wait in expectation of orders. Agreeably to your orders, Lieuts. Martindale, Hopkins, and Fuller, shall be sent back to the Presidency. I must obey, though I must deplore the loss of them from the few officers we have, and the still smaller number who are masters of their duty, and adored by their companies. To part with Lieuts. Hopkins and Martindale, is a loss to the detachment, considered so by myself from my knowledge of these officers, and by all who have commanded them here."

Absurdity
of returns
of ordnance
from a train
while on
service.

"When an army is marching daily, to expect that petty returns of grease and bits of leather can be sent to the Board of Ordnance with the same punctuality as within settled cantonments, is an idea fit only for a clerk; and I dare suppose it never entered into the serious intention of the Board of Ordnance to propose it: nevertheless, I have been troubled with a letter from the Secretary, who, according to the official mode of the business of this department, wrote on the 21st of February, in the name of the Board, an order for the returns

for January to be forwarded, and more punctuality to be A. D. 1781. observed in future."

"I beseech you, Sir, to interpose and prevent this in future. Returns of ordnance are altogether nugatory; what went with my army is expended, with respect to the office books, that business should be deferred till I return, and then a full account ought to be demanded, given and signed, as is the practice of the Board of Ordnance in London. If I am fit to be trusted with a command, surely I am not to be called to account by a boy in office, because some returns of things of no consequence have been deferred, or perhaps have been sent and miscarried. When I must be written to by this Board, I humbly conceive that the letter, intended to be sent to me, ought at least to be laid before the Board; then, if aught be wrong, I shall be sure to explain it, but I cannot now. I know that the Secretary writes what he pleases, and to whomsoever he pleases, without the knowledge of the Board, unless it happens that some insult, too gross to be borne, comes from him in the name of the Board: and surely, Sir, Lieut. McIntyre of my Regiment, is not too great a man to sign the letters of the Board of which he is Secretary, without suffering such letters to be sent by a boy not two months in office, containing a censure on the conduct of an officer of the second rank in the service, who has been in it, perhaps, as many years as the other has existed."

"You are the father of the army, Sir,—to you we must look up for protection against these irregularities,—this subversion of rank and dignity; if you will but defend us, the monster must vanish."

A.D. 1781. "With respect to regularity of books, much trouble will be saved to every body, by considering what goes into the field on foreign service as expended, until it all or a part of it returns; and not to require returns from the army so detached, unless something is wanted from the Board, which it is possible for the Board to supply, and which the Commanding officer wants as necessary to his army. Returns at the conclusion of a Campaign, when the army goes into winter quarters, in addition to those on its first outset for the field, would be quite regular, quite proper, and conformable to the practice of the King's service; and this would give every degree of information that can be requisite, in the proper season."

"The Secretary has written for the annual survey, which absolutely cannot be made or sent: for most assuredly, I will not halt my army a week, to make a survey for the Board of Ordnance, without a positive order from the Supreme Council."

"The absurdity of the present system, is so evident to myself, and to every officer in the army, that I hope you will relieve us from it."

"I am, &c."

On the 3rd of March the army halted at Ballicattee, on the 4th at Piply, and reached Juggernaut on the 7th. Col. Pearse, here writes to the Supreme Council, as follows:

*To the Honorable Warren Hastings Esq.
Governor General, and Supreme Council.*

"HONORABLE SIR, AND SIRS,

"I left Cuttack Island on the 2nd instant. The first part of our march lay over a deep sand, of considerable extent across the Kiljury; a fog, which was so thick that

we could hardly see one another, deprived us of the use A. D. 1781. of our Hurkaruhs, by which we lost our way and were detained till day break, soon after we had reached the high grounds; this of course shortened our march by some miles, and obliged us to halt at Tellingapett, instead of going on to Bulwantee. Great numbers of our bazar people, took the opportunity to desert, and the consequence was, we were short of provisions, not having any village very near to supply us; however, by exertion we got enough for the day, but the distress it occasioned to me was indeed very great, and I sincerely repented having too implicitly complied with your injunctions to dismiss the bullocks. Experience now tells me that I must actually have a reserve in my own power, and therefore I shall provide accordingly.

"The night preceding our march we lost 80 Sepoys, and we continued to lose great numbers, therefore I took the best method I could to conciliate them, by declaring that their expenses at Juggernaut should be defrayed. By this, and other conciliatory measures, I stopped the desertion, and we lost but few on the remainder of our march to this place, where we arrived yesterday morning."

"I must now take the liberty to say a few words concerning this desertion, and the actual causes. The regulations now in force give the Sepoys their batta in Cantonments, *within the provinces*; provisions are there to be had, at two maunds of rice for the Rupee, and the men have nothing to do but to live at ease, mount a guard once a week, where they are as much at their ease as in their tents, and to perform exercise every second or third day. In this detachment they are proceeding to a very distant country, the name of which they had hardly heard before they set out,

Arguments
for increas-
ing the pay
of Sepoys
on foreign
service.

A. D. 1781. and they certainly had not specifically engaged to go to it, though it might have been tacitly implied, under the vague description of their going wherever their service might be wanted. They have to march all this distance through countries, where all is peace, and where they must be restrained from taking wood, potts, &c. &c. without paying, and where provisions are dear: for upon an average, since we left the Sobanreeka, rice has been at 25 seers, from Damnagurat 18, 16, and now 20, for the Rupee; nor could it be sold cheaper, because the Maharattas influenced the people by their own consumption, and by the fear of punishment, if they sold cheaper to us than to their own army; besides this, they are exposed to the fatigue of marching, and to the expenses of carrying their families, without hope of the chance of recompence by plunder; yet they only receive the same sum as in Cantonments, without any addition. When all these circumstances are considered, instead of wondering at so many desertions, I am surprised they were not greater, and that I was able to check them even for a time. Nor is this all; the Maharattas and the Rajah both want them to desert, as well to weaken our army, as to strengthen their own, and of course take measures to inveigle them away. I thought it my duty to submit this to your consideration, since every body here sees it in the same point of view, and reasons in the same manner. To-morrow evening I shall march on again, at least I think so now; but I must not determine positively, for I find that to be at Juggernaut until the close of the Hooley, is of so much consequence to the Hindoos, that rather than give them the inclination to desert, in order to be at that ceremony, I shall stay a day longer; then, if they desert, I

cannot lay any blame to myself, for having been too A. D. 1781. hasty at a critical juncture; in the mean time, preparations are making at the Chilcah, and a day lost here will be gained there, by the great facility of moving afterwards."

"I sent to Cuttack to seek for deserters, having heard that there were many there, but the people that were sent are returned; they went through the forms of search, but the deserters lay concealed, or went out of the way, so that they returned without any benefit to us. A Jemadar deserted, and I am told a party of horse followed us with a spare one for him, which on a favourable opportunity he mounted, and went off with them. I cannot say that this is fully authenticated, yet it may be true; he might have hired them, or they might have been sent to him from the Mahrattas. Hitherto we have had the good fortune not only not to be interrupted, but to have actually been assisted: for when things have been left behind, they have been forwarded to us by order of Moraree Pundit, who attended our army; he has pointed out where supplies could best be had, and we have had them, though dear; however, I feel the truest satisfaction in being so near the end of the most painful part of our march, in which I have undergone much uneasiness, from my constant endeavours to conduct my army through the country, without giving the Government a pretext to quarrel with us. Hitherto I have effected this, and I cannot doubt but I shall fully accomplish your wishes. The day I left Cuttack I was told by letter from the Dawk Moonshee, that the Dawk of the 29th was cut off at Jagepoor, by a party of horse. Moraree Pundit says they were plunderers, and probably they were, though I think it is

A. D. 1781. not unlikely, that as we crossed the Mahanuddee that day, they might have seized the Dawk, to discover whether we had any intentions of attacking Cuttack, which they might have expected to learn from my letters; and besides, I was asked the next day after I crossed it, whether any troops were coming to me from Ganjam; the question surprised me greatly, and though I repeatedly answered in the negative, I could perceive they still had their doubts: a letter I afterwards received from Mr. Turing explained it. A Serjeant had been sent from Ganjam to sound the ford, in order to place bamboos to point it out, and prepare it for our passage; and I have since heard that information was given of this, and the inference drawn by the writer was, that troops were coming to me from Ganjam: this may therefore shew you by what accident the Dawk was lost. We had not any Dawk yesterday, and it is now 1 o'clock, and none has arrived to day; I own this puzzles me, for if any change has been made respecting our Dawk, I ought to have been apprized of it by the postmaster."

"I am, &c."

On the 11th of March the army left Juggernaut, on the 12th they were at Manickpatam, on the 14th at Meetah Cooah; at this place a letter was written to John Turing Esq. Chief of Ganjam, by Col. Pearse, in which is the following passage, which is curious, as it shows that cowries and pice are of a very modern introduction into Bengal.

Cowries
and pice of
a late intro-
duction into
Bengal.

"Another objection was, we had no cowries or pice; coin of a denomination of which our people had never before heard, and which therefore we could not provide, before we had been where such money passed as was

demand; yet there is nobody here to exchange our A. D. 1781. money into their coins."

On the 15th of March the army reached Maloody, and on the 17th Ganjam, whence a letter is addressed to the Supreme Council by Col. Pearse.

*To The Honorable Warren Hastings Esq.
Governor General, and the Supreme Council.
" Ganjam, 18th March.*

"HONORABLE SIR, AND SIRS,

"I have the pleasure to inform you that the army-un-
der my command marched from Juggernaut on Sunday
the 11th, and reached Narsingapatam on Tuesday. The
train and two Regiments crossed the Lake, and at night,
that part proceeded to Meetah Cooah; here we continued
till morning, at which time the three Regiments that had
been behind, joined, and the whole marched to Maloody.
From Maloody to Ganjam, the road lay at a distance from
the lake, and the sand was very deep and loose; for which
reason, though we marched at 9 o'clock, I found it would
too much fatigue the cattle to proceed to Ganjam, as I
at first intended, therefore I stopped at Piaghee, where
the store of provisions was laid up for us; and yesterday
morning, Saturday the 17th, we arrived at Ganjam. I
intend to proceed as early as possible, being extremely
anxious to get forward, but there is so much to be done
here to enable us to perform the rest of our march,
that I am afraid it will detain us four days."

The army
arrives at,
and crosses
the Cluliah
Lake.

"Captain Curfey has been ill the greater part of the march; the Surgeons deem it necessary that he should return to Bengal, I have given him leave accordingly."

"Our camp equipage is now on the point of becoming unserviceable, and we must of necessity commence

A. D. 1781. tentage.* I humbly intreat you to settle the rates, that I may be prepared. I have now 26 officers who carry their own tents; I cannot pay them, because I cannot obtain your orders about the rates. Before I quit this place I shall send you complete returns of the force I now have; I conceive it permanent, and it is with great satisfaction I acquaint you, that our losses at Juggernaut were very trifling, compared with those I dreaded and expected. It is the opinion of the principal officers, as well as my own, that by the halt and the promise of 2 Rupees per man for the expenses at the temple, we saved 500 men from deserting. It was, I own, a misfortune to us to be caught by the Hooley; but as the preparations were carried on at the Chilcah lake, and were so ample as to enable us to march straight forward without a halt, the time was recovered, and the service I hope has been benefited by our detention, as it has devoted the Sepoys to the detachment."

"I am, &c."

A letter was also written to General Sir Eyre Coote—

To Lieut. General Sir Eyre Coote, K. B.

Commander in Chief.

" Ganjam, 18th March, 1781.

"SIR,

"I have the extreme pleasure to inform you that the army under my command arrived here yesterday morning.—

* The allowance for tentage to officers, had always been an object which Col. Pearse deemed of great importance to the army, and, by dint of repeated representations, he at last gained it.

"The peculiarity of our situation made the march A. D. 1781. through Orissa very disagreeable: for we were required to keep on peaceable terms with the Mahrattas, and not to give cause for coming to extremities; and on their part, they were not to impede our supplies, but were at liberty to quarrel, if they pleased. With such a rabble as Chimnagee had, it would have been an act of mere madness to come near our army. Accordingly they moved aside under the hills, and let us pass freely; if he had appeared, it would have obliged us to expend a few rounds of ammunition, which, as we passed in peace, are now in reserve for an enemy, against whom it may be a credit to use them under your directions and command."

"I flattered myself that I should have met your orders here, and could have wished to have had drafts to complete us, taken in the mode of Volunteers, from those who would have effectually filled our ranks with men ready disciplined; however, I shall do my best, and shall teach the recruits we may get, to prime, load, and march, before I reach you, if possible."

"As soon as I can get my returns made out, I shall forward them to you immediately. We must wait here four days to get Bazar supplies, cattle, and servants. If I can accomplish this in less time, I will. I shall set off the instant that I am ready, as I have not any thing more at heart than to reach the scene of action, and to serve under your command."

"I am, &c."

The day had now arrived, when Col. Pearse's army was to be visited by a dreadful sickness and mortality from the Cholera Morbus; and though we are by no

A. D. 1781. means converts to the ouze rice doctrine, as the principal cause of this disease, it certainly ought to be remarked, that the army was not attacked with this dreadful disorder, until the provisions, particularly the red rice, which was supplied to the bazars, was complained of, being of a very inferior and prejudicial quality, causing, (as Col. Pearse states in a letter to J. H. Cashmajor Esq. Chief &c. of the Council of Vizagapatam,) violent pains in their bowels, and fluxes.

At Ganjam the numbers on the sick list, increased considerably, and Col. Pearse, in a letter to General Stibbert, Commander in Chief, dated 21st March, says, "I march to-night to get away from a very unwholesome place. You will see by my returns, that there are 4049 rank and file effective, 325 sick, and 31 on command: part of these last are at Midnapore, and consequently, as they cannot join us, I have ordered them to be struck off."

The first detail of the dreadful sickness which attacked the Army, is given by Col. Pearse in a Letter to the Honorable Charles Smith, President of the Select Committee at Madras.

"Mansurcottah, 22nd March 1781.

"HONORABLE SIR, AND SIRS,

First detail
of the sick-
ness which
attacked
the army.

"I marched from Ganjam this morning, though we were far from being complete in those aids that were necessary, such as coolies, bearers for the hospital, &c. yet such a fatal sickness broke out suddenly in the army, as alarmed me beyond measure. Men in perfect health dropped down dead in numbers; those who were in the least affected, all appear past recovery."

"The cause is unknown: it was attributed to the bad A. D. 1781 effects of the water, also to the violence of the sea wind. I suppose both causes operated, but be the cause what it may, I know of no remedy but marching forward. It is necessary to apprise you, that by my returns, I am now seven hundred short of my complement, and I have, since this sickness broke out, full 500 sick in the hospital."

To the Governor General Col. Pearse wrote as follows.—

"Montredy, 23rd March 1781.

"DEAR SIR,

"Though I was determined not to alarm you, yet as we have newsmongers enough ready to do mischief, I beg leave to tell you that my army has met with a disaster which no foresight could guard against: in short, the whole have drank poison; great numbers are dead, and many are dying."

"It seems the people here use euphorbium juice for soap; and our people, not knowing it, drank out of the ponds in which they washed; many dropped down dead; however, those are recovering who did not take very large doses; but almost all the servants, drivers, and coolies have ran away, and I shall be forced to halt a few days at Itchapore."

"It was only this morning, by accident, that I learnt the cause assigned for this dreadful attack, and have taken every precaution against it."

"I am, &c."

The following letter which was at this time written to Sir Eyre Coote, explains the cause of the detention of the army at Midnapore, and details some circumstances connected with the meeting in the 20th Battalion, com-

making

A. D. 1781. manded by Captain Peter Grant, which has been so often alluded to in the preceding letters.

*To His Excellency Lt. General Sir Eyre Coote, K. B.
Commander in Chief.*

“ SIR,

Causes of
the muti-
nous con-
duct of
Captain
Grant's
Battalion.

“ Doubtless you have been informed by the Honorable the Governor General, that accident detained the detachment, destined to join the army under your command, so long at Midnapore; as however, it is not improbable that the despatches have miscarried, I think it my duty to inform you of it.”

“ When the troops from the 3rd Brigade were ordered to march, the 20th Battalion, commanded by Captain Peter Grant, mutinied, and declared they would not march under his command; but if any other officer was put at their head, they were ready to go on any service. They laid their complaints before Col. Ironside, who caused their wrongs to be redressed by Capt. Grant, and all was apparently appeased; but the Battalion had mutinied against him twice before, and it appeared to me very likely they would do so again; for they had said, ‘When we get our ball ammunition, we will show you a sight.’ The mutiny opened the eyes of the Government, and all persons, of all ranks, were clamorous against Capt. Grant, and his bad practices, and exclaimed against such an officer going on a service, where union was so indispensably necessary. As the cry became general, the mal-practices became public, and were found to be of so very dangerous a nature, that nothing but a total change of establishment could save the Company’s army from absolute ruin. This produced the change of which undoubtedly you will hear, and I trust approve; for I join in the opinion

Robert

that we were on the eve of being swept off in a general A. D. 1781. mutiny. It is true, there were some who abhorred the practices; but their example could not stem the torrent of corruption, and they were as liable to be removed from their Battalions as others, and might have been succeeded by officers less attached to the service than to their own emolument. In consequence of the change of establishment, Capt. Grant's Battalion was ordered to be drafted into the five Regiments that composed the army under my command; they were cleared off by himself, and publicly declared they had not any demands to make on him, which, at that time, was true enough, because they had previously extorted their dues from him; but he laid the foundation for further complaints, by declaring, that they were dismissed for their ill-behaviour, and mutinous conduct against him. The Sepoys on hearing it, declared they would not go into other Battalions, for that they should now be looked on, as mutineers, and ill-treated accordingly, and therefore they would not engage in the service any longer. But though this declaration was general and public, it was not reported to me, and I assure you I never heard it until it was too late: they were drafted; but some Havildars desired to be excused, and begged to go with the other officers,* which was granted, for two reasons, the first, because they were supposed to be disaffected, the second, because taking them at all, was mere matter of favour; before night above 300 deserted. Though watches were ordered round the camp during the night to check further desertions, great numbers escaped, and in all about 400 got clear

*The native officers of the 20th, had been ordered to be dismissed the service.

A. D. 1781. off; the native officers were instantly charged by Grant, with having instigated the Sepoys to desert; and I was made to believe it at the time, and ordered the whole to be closely confined, representing the transactions to the Council. But the men began to talk freely, and accuse Grant in such plain terms, of being himself the cause, that I quickly understood I was in an error, and wrote to the Council to recal my opinion. My letter arrived in time, they were not dismissed, as I had heartily recommended; but I was ordered to take Major Edmónstone, and whom else I pleased of the principal officers, and to examine every native officer separately; the result was, that the Battalion had never mutinied or misbehaved before Grant got the command of it. It had been six months on hard service, without receiving a Rupee from Government; frequently making marches of 30 and 40 miles a day, without a single murmur. The men had sold their wives' jewels and every thing they had, for subsistence, and returned to Chitpoor, where they in one day received 5 months pay; but the next day, feeling themselves oppressed by Grant, and cheated, they by resistance obtained their dues; the particulars of the oppression are of no consequence, as it will appear most fully on his trial. The desertion from the army detained us for drafts, which did not reach us until the 8th; and on the 9th I marched."

Col. Pearse proceeds to detail the circumstances of his march, the dreadful sickness which had overtaken his army, and concludes the letter as follows:—

"We have now about 900 sick, we had only 375 when we arrived at Ganjam. It seems that there was a disorder of this kind at this place about a month ago,

but, it is gone off. I heard of it at Montredie also, A.D. 1781. where it destroyed about a thousand of the poor inhabitants; at Mansurcottah it raged."

"When the disease attacked our people, some fell down dead; others were seized with violent vomitings and purgings, and died; others died from violent spasms in the bowels; but we are now recovering, for those who fell down yesterday and to-day, were not affected so violently, which shews that our marching on has had a good effect. Whilst I am writing this letter, I have the extreme happiness to receive your's of the 6th inst. and shall obey your orders with all possible expedition: every delay is painful to me; every man I lose, a wound. I covet the honor of sharing under your command the glories of this difficult war, not doubting but success must crown us now, as it did before, when the troops had the honor to serve under you."

"I am, &c."

"Itchapore, 24th March 1781.

At this halting place, however, Col. Pearse thought it necessary to assemble the officers commanding Regiments in his army, in order to deliberate upon the best means of protecting the troops from the prevailing sickness. The following letter was laid before the assembly:—

"GENTLEMEN,

"I have called you together to consider what is best to be done in the present exigency. I need not represent to you, that full half the army are sick, or will probably be so in a day or two. Your own returns give you the most melancholy proof of it. I was not prepared for

Col. Pearse
assembles
the officer's
of his army,
to deliber-
ate upon
the best
means of
protecting
the troops.

A. D. 1781. an event of this nature, weakened by desertions; and still more by this calamity, little can be expected from us; the calamity will inevitably increase as we advance, for the winds and dews seem to be the cause of it, and not the water, as was supposed, or the provisions."

"Our men are totally unprovided for this climate; they have no tents, and in general, not even blankets to protect them from the inclemency of the season. Had I been acquainted with the nature of the climate, the calamity might probably have been prevented, by an application for tents. We learn that the Sepoys of this (Madras) establishment all have tents, while we know that at this Presidency, every expense that can be avoided, is even parsimoniously spared, and nothing but the necessity of having them could have induced the present Government to allow them. If tents are necessary for their own troops, far more so must they be for troops coming from a mild climate, where the dews are not so severe, and the winds, if violent, are dry when compared to what we are now continually exposed."

"I shall not say any thing to bias your judgment; I call for your advice, not doubting but that I shall be better enabled to form my own judgment from that advice, which your unhappy experience of the nature of the complaint will enable you to give me. It is a very melancholy reflection that our services are so necessary, but unless we are able to protect ourselves, we cannot be of much assistance where we are wanted."

"I beg you will be pleased to deliver your opinion upon the measures to be pursued, in writing, as I shall send that opinion, to inform our superiors, of the necessity there is to take such measures as you may recommend."

"To give you every information in my power of the A. D. 1781. situation of affairs, I lay before you the letter I yesterday received, from the Commander in Chief."

"I am, &c. &c."

Harassed and opposed as Mr. Hastings was in his Government, to a degree that embittered his peace, it was probable that he often felt a partial relief by imparting his feelings to a man of such sterling uprightness as Col. Pearse. Accordingly many very confidential letters may be supposed to have passed between them, and to the lasting honor of Col. Pearse's memory let it be recorded, that not in a single instance does he appear to have solicited from his friend, whose high station afforded him the best means of promoting it, the advancement of his own private fortune. On the contrary, the good of the service seems to have been Col. Pearse's constant aim; and though the just and laudable ambition of a soldier had its full sway in his breast, he disdained many of the mercenary advantages which the custom of the times tolerated.

Col. Pearse writes the following letter, as a private friend, subsequent to the receipt of one from Mr Hastings, in which the latter had evidently unbosomed his feelings to one, whom he found so worthy of his trust.

To Mr. Hastings.

(Private.)

"Oh, my dear Friend! I have had such a trial that I can hardly relate it. If I wrote to you almost distracted from Bulwantee, because my Sepoys felt hunger for a few hours, and were deserting; judge of the state of my mind when death was raging in my camp with horror not to be described. In those moments of dismal expectation, how-

A. D. 1781. ever, I composed myself enough to write a tolerable account of the misfortune that seemed to be impending, though I confess to you I then expected to be devoured by pestilence; in vain I studied to discover the cause of the misfortune; I attributed it to poison, and told you so; but now I find there has been a pestilential disorder raging in those parts of the country through which we past; and little did we suspect, while we were rejoicing at our exertions, that part of our camp was inhaling the air of death and destruction."

"By great good fortune I advanced, and as I marched on, though the pestilence was not stopped, it gradually diminished. By inquiry I found it had raged at Mansurcottah, as well as at Montredie, and had destroyed vast numbers:—to day I learnt that the same disorder had been as violent here some time ago, but was now gone off; and here too I found my sickness diminishing, and health returning."

"To comfort me, I had the happiness to hear from Coote and yourself, soon after my arrival. Your letter was a duplicate of that of the 6th, which fully explained the cause of the letter of the 13th of February, that had given me so much pain. Where will that man's wickedness end? wretches they must be who would dare to act in the manner you describe, but such I know there are in Calcutta, and I can fix on three, very capable of doing what you mention, though possibly I may be mistaken: however, I know you despise them as much as I do from my soul.—Peace on their own terms!!!—ruin to every body. Why did they not at once propose embarking for Europe? for certain I am, if you had yielded to their importunities, that must have been your present condi-

tion. That Chinnagee's banditti had been represented A. D. 1781. as formidable I know; and when I entered his country I was still doubtful; but when I saw some specimens of his army, I only felt contempt: but it is a prudent maxim never to despise an enemy; for by so doing you give him an advantage, as an enemy despised often undertakes what never could have entered his head, if he had only apparently been considered of some consequence."

"I sent you the news we had received of Goddard's victory; I hope it is true: and I think, with his successful army, that it is likely, but it is not yet confirmed; and as it bears date from Madras, I fear that it is only a political *fudge* to keep up drooping spirits; yet the news, that Hyder had laid waste Madura, Tinnevely, and Tanjore, seems to be some confirmation of it, and gives reason to believe that he is going away."

"I own there is another cause for his doing this: he may have judged that Coote could only get provisions from thence, as those countries lie to windward, and Hyder seems able to form a plan conformably; however, his movements will quickly shew what are his intentions. I rejoice at your firmness in rejecting the infamous proposal, and trust that you will never make peace till they agree to take the Prince for their Peishwah, and to make the present Ministers his. I have just seen Dr. Gillies, who tells me that he has opened some of the bodies, which had every appearance of having suffered from a strong poison. Excuse contradictions, they are only about things of conjecture, and that I do not thoroughly understand."

"The preceding part of this letter was written yesterday and the day before; I have now the satisfac-

A. D. 1781. tion to say, that we are fast recovering, but we have 1133 sick."

"I am glad to hear of Rajah Ram Pundit's journey to Calcutta with Anderson. I hope you will now be able to settle matters to your satisfaction, with Madajee Bonsla, and gain an ally."

"Itchapore, 26th March 1781.

In consequence of the great number of sick, and the want of tents, Col. Pearse found it necessary to request a part of the inhabitants of Itchapore to give up their houses for a short time to his army, and on the evening of the 25th the army marched in."

Excellent
behaviour
of the In-
habitants of
Itchapore.

The inhabitants of Itchapore are mentioned as having complied with this request in the most willing manner; the sick of the army derived the greatest benefit from the shelter thus afforded them, and many of the healthy, probably, being thus protected from the causes of the disease, escaped it altogether.*

The wind, during the day at Itchapore, was more violent than it had ever yet been experienced; and at night, though its force abated, Col. Pearse mentions it as being accompanied with such a penetrating moisture, that he felt wet through his great coat and waistcoat, though both were of cloth.

* Even at this distant period, the erection of a monument at Itchapore, in commemoration of the above circumstances, with a suitable Inscription, would be honorable to the East India Company. The European traveller would view such a monument with the most grateful feelings, and even the impression which it would doubtless make upon the minds of the Natives, void of feeling as they are, would be creditable to the British character. Still more worthy of the government, would such a design be, if connected with a fine Tank-Well or Aqueduct, gratuitously conferred upon this Town.

The natives of the army, who had as yet been the A. D. 1781. principal sufferers, were now fast recovering ; but on the 28th of March Col. Pearse writes, that the Europeans were beginning to fall sick. It may be supposed that opium had not been applied as a remedy by the Surgeons of Col. Pearse's army, from the following passage in a letter to J. Hodges Esq. Chief of Masulapatam.—

“ I imagine there is some mistake about opium ; I do not know that an ounce a day is used in the whole army, consequently we cannot suffer from the want of it”

Now, though this certainly alludes to opium, as a drug in common use amongst Asiatics, and Mr. Hodges, (who was to procure provisions for the army passing through his district), had probably either requested to know the quantity requisite, or informed Col. Pearse of the quantity in store ; yet, had opium been used as a medicine, it is probable that some allusion to its use in this manner, would have been mentioned.

On the 30th of March, Col. Pearse thus concludes a letter to John Turing Esq. Chief of Ganjam :

“ The good effects of shelter are evident from the fast recovery of the sick. Permit me, therefore, to testify my grateful sensibility of the goodness of the inhabitants of this place, who, notwithstanding every inconvenience, most readily gave up their habitations, without a threat of using force on our part—without a single murmur on theirs. In consequence, thereof, I have used every endeavour to prevent mischief. I do firmly believe, that the town has not been damaged to the amount of 50 Rs. though individuals have suffered great inconveniences. From their readiness on this occasion, the inha-

A. D. 1781. bitants deserve at my hand this public testimony of it, in order that it may be duly appreciated, and some mark of public approbation be the reward."

The army marched from Itchapore on the 1st of April, when Col. Pearse writes to Mr. Hastings, respecting the improving health of his men.

The sickness in the Army abates.

"I begin with telling you, that we are alive, and in motion again; and that by my halt I have saved great numbers; the sick are not half so numerous, I left 320, and have 200 convalescents going on with me, who are still in the hospital, and marching: the rest have joined their Regiments."

A letter to Sir Eyre Coote follows,

"Cutwal Talaub, 1st April, 1781.

"SIR,

"Yesterday I wrote informing you of my intention to march, and I sent a return of our gross numbers. In the same letter I acquainted you with the want of officers, and entreated you to send some of the volunteer Company lately promoted to Ensigns.* I have been forced to leave one officer behind, Lieut. Newport, who is sick; if he recovers he will never be of any use, he is not fit to be an officer. I should dread trusting him with a Sergeant's party. Most of my Subalterns are very young; not one in six ever saw an Army before, and I really labor under great difficulties, which I merely mention in hopes of obtaining more officers. The troops were totally destitute of tents, and to that cause

* These consisted of a number of young Irish Gentlemen, who volunteered to serve the Company, and came out to India upon the chance of finding employment, and obtaining commissions; they accompanied Sir Eyre Coote to Madras.

great part of the raging sickness may be attributed : for, A. D. 1781. if they had been covered, it is probable the effect of the winds and dews would not have been so dreadful. Therefore, with the advice of the Field officers and Surgeons, I have applied for tents, like those in use on the coasts ; and I have written to Chicacole, Vizagapatam, Masulipatam, and Madras, to request a supply."

"In the old system, nothing was attended to but emolument, and had it continued much longer, I do upon my honor believe, that we should all have been cut off by a general massacre. The mutinous principle was gaining ground, and was visible to all who have seriously reflected upon the past events."

"When the Majors thoroughly understand what they are, and the Subalterns begin to know their duty, the army will wear a very different appearance. In consequence of a total want of discipline, I found myself under the necessity of issuing some orders, respecting things that I was ashamed to suppose a Commanding officer was obliged to attend to. Judge of my vexation when I was formally told, that my orders were almost impracticable ; for the Native officers, it was said, had never been accustomed to do what I had ordered, as it had hitherto been done by the sircars of the Battalions, who were now sick or dead. All this was only about an order to keep daily report-books, to prevent the delays in making returns of common occurrences, which had been lately so very incorrect, as to call forth my displeasure."

"I shall put the troops into villages, wherever I can get cover, until our tents arrive. I hope for drafts to complete us."

A. D. 1781. "Our baggage shall be reduced. I shall be very happy if I can get a copy of your regulations, that I might conform to them as closely as our situation will admit."

"I am, &c. &c."

Compared with the number of men who were attacked with the Cholera Morbus, the proportion of death was small; but Col. Pearse mentions, that the disease was attended with far greater mortality amongst the followers of the army. On the 12th of February, Col. Pearse stated the strength of his army, in a letter to Sir Eyre Coote from Ramchunderpore, to be 4,860 fighting men; and on the 5th April, the numbers were reduced to 3,955, shewing a deficiency of 905 men: perhaps one half of this number may be accounted for by desertion, so that a ninth part of Col. Pearse's army may still be said to have perished from the disease, exclusive of the deaths amongst the followers.

On the 2nd of April, the army reached Burgun. Two hundred casualties from desertion, supposed to proceed from the dread of the disease, and the fear of advancing further, are officially announced from this place.

On the 3rd of April the army entered the Chicacole district, and halted at Tickelly; from this place the following long, but interesting letter was written by Col. Pearse to the Governor General.

To the Honorable Warren Hastings, Governor General.

"Tickelly, 5th April, 1781.

"DEAR SIR,

"I have this day overcome the deserts of Ganjam, and entered the Chicacole district. My men are reco-

vering fast. Desertion swept off a good many, but it A. D. 1781. has abated very considerably, and after all, we have 3,955 fighting men left; so that, if we get drafts to complete us, we shall do very well. The pest was general through these districts, though I knew it not. We reached Ganjam just at the equinox, and the long-shore winds blew death and dismay in our faces: hence the desertion."

Long and
important
letter from
Col. Pearse.

"I must tell you, that the wrangling between the Majors, Captains, and Subalterns does an abundance of mischief. I did flatter myself that a code of laws would have appeared amongst us before now to have defined their respective duties beyond the power of dispute. The attempt now is to discourage the Majors from having any thing to do with their Regiments. The Captains want to make them cyphers, which if once established, the old system comes round, and massacre will follow. They labor hard to discourage the Subalterns from taking care of their Companies, but in this case they work in a different manner, viz: by promoting discontent, and by making it appear that every order is a grievance, every duty a hardship."

"The enclosed paper had very nearly made its appearance in orders, and I am not sure but it must still be issued. Major Kilpatrick raised a Battalion—has been at the head of it ever since, and in consequence of the desertions from it, felt like a father."

"He ordered the Captains to send the native officers to attend on him, that he might endeavour to ascertain the cause of the desertion, and set the officers to stop it by threats and promises. The Captains sent the Native officers, and Major Kilpatrick was proceeding

A. D. 1781. in a very proper manner, asking how many each Subadar had lost, enquiring the cause &c. Scott went to him open-mouthed, told him that he was doing what was unmilitary and not allowable; if he wanted to know any thing about his Battalion, he ought to ask him, (Captain Scott) only, and told him that he would complain. He did so, but made a false representation, for he acted upon the report of his Native Adjutant, who told him that Major Kilpatrick was taking a return from the Subadars. Sandford, more violent still than Scott, instigated a Lieut. to put a Subadar in arrest, for going to Major Kilpatrick. I sent for, and spoke to both, and the Subadar was released presently. The act was mutiny, and if Kilpatrick has not a full apology for it, we shall come to a Court Martial."

"This is only introductory to request you to hasten the regulations—to give the Majors all possible power—to explain the duties of the Subalterns, and to enjoin the Majors to enquire from time to time whether the Sepoys get their dues: in short, at every muster, absolutely, without any excuse but sickness, to hear the roll called, and then to ask the company whether they have any complaint: whether they are duly paid, and get all they ought, or whether any stoppages are made from them, not fixed by order of Government or themselves; and the Major must report afterwards, that he has put these questions to every company—that he heard the roll called—and if he received any complaints to state them also. The penalty of not asking and reporting, ought to be the loss of a Regiment or the service. The Commanding officer of the whole, ought to be compelled, under certain penalties, to count the files or to cause it to be done before him."

"No man reported sick, ought to pass muster, unless A. D. 1781. he is present, or in the hospital; and whilst the muster is taken in the field, the Surgeon ought to muster the hospital, and to send a written report of the names of the sick, their companies, and regiments."

"The Major ought to certify the number present at muster; that the numbers returned on duty, or on command, were agreeable to the orders concerning the duties; and the number of sick, conformable to the Surgeon's list."

"Unless these, or more rigorous rules are laid down, beware of the effects of the old system. I wish that I could find time to draw out the regulations; however, when they come I can examine them, point out what I conceive to be further necessary, and so proceed till the rules are as positive as the articles of war; then, dear Sir, let Wilkins print them."

"Let forms of every book and report, roll and return, be printed, for all, even for the boys to purchase ready to fill up daily. Let it be the duty of the Major to examine these books after every muster, and to enter in the book that he has done so."

"The boys I have, are in general of a year or two standing, and ignorant of every duty, and, of course, most complete *Generals* and *Judges* of the propriety of every order; few even can speak the language."

"If the rules, therefore, were printed in Hindoo on one side, and English on the other, and an alphabet at the beginning, you would afford the means of their performing the duties, by teaching the young officers the necessary part of the language, and in a year or two, a boy might really advance beyond "*Shraub Paunee*"—

A. D. 1781. The Sepoys also would know their dues and the rules of the service, and be less liable to oppression. My Hindoo orders have done a great deal of good here already, but they have lengthened faces."

"Explode sircars, and order the reports to be taken from the orderly havildars, as they are from corporals and sergeants in European corps. When I ordered daily report-books, I was told that the Native officers did not understand those duties; they had been always performed by sircars, and could not be done in the manner I directed by the Subaltern officers; the English of which is, the Native officers were never permitted to be in any degree acquainted with the state of their companies, that was a Battalion mystery, sacred to the grand Priest and his assistants at the altar; and now whoever attempts to expound these things, is a demon."

"Some while ago I ordered the recruits to receive full pay; the pleasure was inconceivable; when the Sepoys saw rupees and an European distributing them, the phrase ran, '*this is new, but good indeed for us.*' I firmly believe that I should not have lost 50 men after I crossed the Chilca, if I had not met the pest."

"That I may carry 3,500 men to Coote, is the utmost of my wish; and I think he will have no reason to wonder there are no more, when he considers the great distance, without a single day's plunder to keep men in temper, or a single day's fighting to divert their minds, from a country that seems made up of the *shreds and fragments of a world, in dame Nature's shop, producing nothing but sand and craggy rocks, brackish water, and pestiferous winds.*"

"If ever you want to send an army to Madras again by A. D. 1781. land, it must be done through Nagpore and the Nizam's country; for it is barely possible to drag troops this way: and I hardly think that you will find an officer bold enough, or rather fool enough to undertake it. We have not left in the whole army sixty of the drafts we received, which shews that we should have been much stronger, if we had had another Regiment instead of them; and if we had been formed on the esplanade, as I begged and intreated, we should have had tents, and our army would not have been exposed to these terrible winds and dews."*

"The Surgeon who came to us from Ganjam was taken ill the morning before last, and was dead before 9 p. m. of this disorder; if we lose another we shall be undone."

"I hear Mr. Boyle, the volunteer, is about to be appointed a Cadet. I hope that it is not true, for he was turned out, by a general refusal of the volunteers to associate with him. I believe Coote laid the circumstances before Council; it was just as he was going away to Madras. The fellow is a sneak, and skulked when the lads were going on service, and was a disgrace to them by his meanness in other respects, shewing that he wanted a very necessary ingredient in a soldier; however there was one made an officer very lately, who was ten times worse. As the five ships are taken, you will be forced

* Notwithstanding the information which Government had already received by the march of Col. Pearse's Army, strange to say, another detachment was sent round by land, under Col. Cockerell, to proceed to Seringapatam, in 1790. They marched without tents, and the Cholera Morbus again committed great ravages in this detachment, when they had reached the vicinity of the Chilca Lake, in the middle of April.

A. D. 1781. to ransack Calcutta again; and if there is such a *haul* as the last, there will not be a shoeblack in Calcutta, nor a gentleman in the army; therefore, as I know you really love the army in your heart, let me intreat you not to let one be admitted without a patron, and to direct that the name of the patron be registered; and that he be examined, and required to certify that the person was never a menial servant, can read and write, and has some qualification of a gentleman. Stibbert, with abundance of good qualities, is far too easy in this respect, and recommends too much at random. The man too, who is to become an officer, ought to be produced, to shew that he is neither too old, nor disabled."

"I am, &c."

Army ordered to halt, to wait for the junction of 2,000 Mahratta horse.

The army marched to Runhun on the 6th of April; to Calingapatam on the 7th; to Chicacole on the 8th; and to Vizanagram on the 11th. Here a portion of the tents which had been applied for by Col. Pearse reached the army, and they were immediately distributed amongst the different Battalions. At this place also, an order arrived from the Supreme Council, to halt the army, and to wait for a detachment of 2,000 Maharatta horse, from the Rajah Chimnagee Baboo.

Col. Pearse writes to Mr. Hastings, in answer to the order, as follows:—

*To the Honorable Warren Hastings. Esq.
Governor General, and the Supreme Council.*

Vizanagram, 17th April 1781.

"HONORABLE SIR, and SIRS,

"Yesterday evening, just as I was about to give the orders to march, I had the honor to receive your letter"

directing me to halt at the most convenient place, to A. D. 1781. wait for the junction of a body of 2000 Mahratta horse."

"It gave me inexpressible happiness, for I had heard that Tippoo had been detached to lay waste that part of the Carnatic, through which we are to march, and I consequently knew that I must set off with a large convoy of provisions, sufficient to subsist us during our progress; but at any rate, the convoy must be very considerable, as Sir Eyre Coote is in want of cattle for his army and his bazars, which we only can convey to him."

"I have determined to halt where I am part of the time, as it is a land of plenty; and we have a delightful grove sufficient for the whole army, with a running stream of excellent water in front, and a very large Tank besides."

"We have received about half our tents, and when I get the rest I shall advance slowly, and suppose the horsemen will meet us at Ellore; I must at any rate get there to collect my convoy, and to be ready to set off in full force as soon as the Mahrattas join us."

"I should be happy to know, by what route the Mahratta horse will come to us, and shall prefer that by Ellore on this account; we travel without doing mischief, and as I can govern an army in that respect, therefore, I choose to pass through the country where mischief is possible, that it may be clearly ascertained, if any is done, that my army did not do it; and possibly when the Mahrattas find that we pass on without doing any damage, to the countries we pass through; they also will from example and shame, preserve as strict a discipline."

A. D. 1781. "I made a small mistake in my last letter; I said, the paymaster has exchanged 1820 Gold mohurs at 14 Rs. 8 as. arcot. I should have said, that he had been offered them for that amount: the bargain was to have been closed when we marched off from hence. As soon as I received your orders to halt, I directed the paymaster to delay the final agreement, and he informed me the pause he made, had produced an offer of 15 arcots, which was the same as at other places; with this I shall be forced to close, as we now must have currency to pay the troops."

"It affords me great satisfaction to inform you, that the dreadful scourge of sickness has gone off. I left 341 men behind, and many arms became spare by desertion; they are all about to follow, but have been detained for carriages."

"The expenses of carriage for the hospital, will of course be very heavy; though as soon, as we are collected again, I shall reduce the expense as much as possible; but of this I must apprise you, that 70 Doolies will absolutely never suffice for us, if those of the Battalions are included; yet 70 besides those of Battalions will seldom be wanted."

"Vizeram Raz, had a body of Pikemen and other troops ready to join me, and was greatly disappointed by an order to disband them; he expresses the greatest desire to go with us, and pleads the long period of the alliance of his family with the English, in the worst of times, as reasons why he thinks he might have been exempted from the general order to disband. At his desire, I put my troops under arms, and he saw them."

"It afforded me the truest pleasure, to see such a total A. D. 1781. change in the countenances of my men : when I mustered at Itchapore, the few who did appear were dejected ; a silent horror overspread every countenance; the scene was really sufficient to account for the subsequent desertion."

" Some of our deserters are returned, about 20. I have sent out a fresh proclamation of general pardon, on surrendering any where within my reach."

" I am, &c. &c."

The following letter to Mr. Hastings, was written from this place.

To The Honorable Warren Hastings, Esq.

"DEAR SIR,

"The accompanying papers are the rules you so long ago ordered me to draw out, and sorry I am, that I had it not in my power to do it earlier: the halt at this place has enabled me to set to work, and I have accomplished it as well as I could; but besides the desire I had to finish what you had directed, the necessity of the case was a sufficient inducement to me to undertake the task; for I am truly sorry to say that anarchy and confusion are now reducing into systems, and there seems to be only one thing aimed at, that of destroying every check intended by Government to be established; and to sap the foundation of all authority, to the end, that the old system may raise its diabolical head—emolument, set aside honour, honesty, and the good of the service; that the vile practices which disgraced us in the eyes of all mankind, may once more rage through this army."

Col. Pearse forwards to Mr. Hastings, a draft of Regulations for the Military Service.

A. D. 1781. "But permit me to say, this shall not be so while I can prevent it. In my last, I told you what orders I had intended, and that I had, as I then thought, brought men to their right senses. Alas! I was only deceiving myself, by believing that true which I wished for. I have been forced to issue the orders which I inclose, a short fact will shew the necessity of it."

"A Major recommended two Sepoys, to his Captain for promotion, and he says, that they were very old Sepoys: the Captain refused to appoint them, and in the promotions very young Sepoys were appointed; one, in particular, who had not been a year in the service."

"By this I found that the Majors were to be reduced to cyphers, their orders were to be disobeyed, and they were to be laughed at. Subordination and respect to authority, were to be trampled under foot; and every thing that could tend to destroy an army, was to prevail."

"Again, a Major finding his Regiment had suffered by desertion in a very extraordinary manner, sent for the Native officers to enquire the cause of it, and to ask the numbers gone off. A Subadar who was sick went, though hardly able to crawl; he had not done duty for some time, consequently he had not reported his company. The Subaltern was advised to put the Subadar into arrest, for going to the Major's; he was put into arrest, and was told that it was because he had gone to the Major and reported his company, and had not reported it to his Subaltern. I had occasion to speak with the Captains of that Regiment next day, in consequence of other disputes, and I declared the act was mutiny;

that the person so doing had committed mutiny; and A.D. 1781. that the adviser of the young man was guilty of exciting to mutiny. The man, however, was released at the time, the crime had been given in a faulty manner; it was a boy who must have been sacrificed, and he neither knew better, nor even understood the language well enough to explain what he said to the Subadar; and as he apologized to his Major, and assured him he did not mean to confine the man because he had been to his tent, I passed it over, and sent for the young man, rebuked him, and pointed out to him the enormity of the crime which he had committed."

"These practices, however, drove me to issue orders for temporary relief; for I am determined to support authority, and to establish subordination. I drew the line according to the practice in my own Regiment, and of that in which I was bred up, and agreeable to the practice of Wolfe, in his Regiment; but I had no sooner done it, than every mouth was opened, and I was charged with innovation. It was said, this was not the practice in the Regiments of Infantry, the Lieut. Colonels appointing Serjeants and Corporals in their Battalions, without the interference of the Colonels; that by the orders in force they were vested with the powers of Lieut. Colonels, and that I had set aside the orders of Government, and deprived them of their just rights."

I was asked to repeal the order, I refused; I was asked leave to resign the Battalion; I declined it, only for want of power if I had done it, to admit of total resignation of the Service. I would have accepted of the commission, but as my orders were from the ignorance of boys, and the perverseness of men, not under-

A. D. 1781. stood ; I issued explanations, fit only for boys to read; which I blushed to think were necessary. I was then told, that an appeal would be made to the Commander in Chief; this rivetted the order past a possibility of alteration; for had I yielded, every order that I should have given would have been appealed against; and if some of the wise men had chosen to halt at any place, I should have been forced to stop, for fear of appeal. All these circumstances shall come before the Board. Thus, at the time pestilence and desertion were weakening the army, we were tormented with intestine broils. It was not sufficient that I declared that all disputed points would be settled by Regulations which I knew were coming, and for the present recommended union; but at last I was obliged to call every body to unite by my orders."

" Now, with regard to Lieut Colonels of Regiments, I have to observe, that possibly the Colonels do not interfere in such promotions, but that is not for want of right; they are not mere Colonels, they are Brigadiers; and having a general line to attend to, are necessitated to delegate their less important rights, that they may have time to attend to their more important duties. The Lieut Colonels have, besides, a scope for importance in their Brigades, in the granting of warrants to the Native officers."

" The Majors being in the place of the Colonels of Regiments simply, must have all the rights of a real Colonel, or be cyphers. If they cannot appoint havildars, they cannot have any appointments to make, for the Colonel of the Regiment, appoints warrant officers; and the Captains, some at least, claim a right to re-

commend them also, and think the Majors have no A. D. 1781. right to interfere even in them. Others rest the grievance in the part which enjoins seniority, and give the Subaltern the right to recommend. Who is so fit a judge as he who commands the company? Can a Captain know every man? * shall a smart appearance, and a pretty face, set aside long and faithful services? shall dangling about as an orderly, claim merit before fighting battles? Whoever supposes that I will let such a system prevail, where I am present and can prevent it, must think me what I am not."

"I was told too, that old Sepoys, men of real merit, were disgusted at being set aside to make room for pretty boys. When desertion prevailed, and amongst veterans, was it unnatural to suppose they deserted from neglect? and how could I calm their minds, but by ordering their merit as soldiers to entitle them to reward?"

"But what I ordered, after all turns out to be a regulation of the establishment; for it is ordered that the commanding officer of the Sepoy corps shall appoint havildars and Naicks, so early as 1772; and by Cootes Regulations, the Naick of next merit, when a vacancy of a havildar occurs, must be presented to the commander of the Sepoy corps for his approbation. Parker exercised the power, yet it was unrepealed, though applications followed, and he was hated for using it,—and why,—only because it struck at the root of corruption."

"From all that I have said, the necessity of laws to govern is so evident, that I have devoted night and day

* There were no Captains to companies at this time.

A. D. 1781. to write the sketch of them for you ; and if they are not all perfect, (which no human production can be,) it will at least I hope shew, that I am never idle, and devote my time to my duty. I feel that I have been forced to turn my mind to intricate subjects, when I wish it at ease to govern my army in its difficulties. That what I have done may please as an attempt, is all I can hope for."

"I am, &c. &c."

"P. S. I shall send even the forms, but they are not ready."

"If what I have written on the subject of the Regulations merits consideration, and you think proper to submit it to Stibbert, let me beg you to tell him, (as he will at once discover by the hand writing, whence it came,) that I drew out these rules by your immediate command, and sent them to you in consequence of it : otherwise, he will think that I want to usurp his authority, and to exonerate him from the trouble of commanding the army. I think that he will long ago have been bewildered with the subject, and that he will have been so teased with applications, against every check, that he will hardly be able to support it. It is a pity that he cannot resolve to shut his eyes and ears against every vexatious remonstrance."

The following Return of the army, was forwarded to Sir Eyre Coote, from Vizanagram.

A. D. 1781. Present with this large detachment, and crowded hospital, there were only two European Surgeons; if these performed their duty, it must have been laborious indeed, but it was hardly possible they could do so. Col. Pearse, finding the want of Medical officers, applied to have a gentleman of the name of Martine,* (who was with the Army, and who represented himself as having been educated as a Surgeon,) appointed to do duty with it, which was subsequently complied with.

On the 23rd, the Army marched to Brunsing, as Col. Pearse, having received intimation, that the river Kistna would soon begin to rise, was anxious to hasten towards it, to prevent difficulty in crossing his Army. On the 25th the halt was at Vantipellore; on the 26th at Soobarum; on the 28th at Ankapilly and on the 29th, at Elmunachilly.

The increased establishment of the Native Infantry, (which had taken place in the latter end of 1780, to form Col. Pearse's army,) was attended with an alteration of system, which led to the most vexatious altercations between the Captains commanding the Battalions, and the Major commanding the Regiment. Numerous appeals to Col. Pearse appear, but the following letters to Major Wedderburn, and to Mr. Hastings, will generally explain the nature of them, and will also throw some light upon the formation and discipline of the Bengal Army in 1781. The letter to Mr. Hastings also records, that the liberty to print a newspaper in Calcutta, which Mr.

* This was the afterwards celebrated General Martine, who had followed the army from Calcutta, and was ever ready with an intelligent mind, and active body, to offer himself in any capacity, when the wants of the service presented an opening for employing him.

*From Mr. Martine's letter to Mr. Hastings
referred to (General Martine had the rank of*

Hastings had granted to an individual of the name of A. D. 1751. Hickey, was soon abused.*

To Major Wedderburn, Commanding the 25th Regiment.

"Ankapilly, April 28th 1781.

"SIR,

"A representation has been made to me, by Capt. Pearson and Lieut. Vanrizedell commanding the two Battalions of your Regiment, setting forth that you have issued an order directing them not to manœuvre their Battalions without a particular application made to yourself; that the constraint such an injunction puts upon them, may prove detrimental to the service, by depriving them of the small authority of being able to exercise their Battalion, without first applying for permission on every occasion; and that the Regulations leave to the Captains, the full power of disciplining their Battalions."

"Be pleased, Sir, to inform those Gentlemen, that I have carefully considered their representation, and I am of opinion, that the order issued by you, is in itself extremely proper, and consistent with military discipline and subordination; in which it is undoubtedly a principle, that in every Regiment the Colonel shall be the principal officer; and that all officers of that Regiment, act, in conformity to that subordination under his orders and directions. That the Colonel is answerable to Government for the well being of his Regiment; and the several

* A most effectual mode was taken by Mr. Hastings, to prevent the circulation of some abusive paragraphs in this paper, by sending an order to the Post Office, to prevent any newspaper or parcel from Mr. Hickey, from being received or carried by Dawk.

A. D. 1781. commanding parts of that Regiment are, in the first instance, answerable to him for the good condition and discipline of those parts : consequently, that it cannot be detrimental to the service, that every thing be done in each Regiment, conformable to this principle, and, of course, with the authority of the Major Commandant, who stands in the place of, and enjoys every privilege of a Colonel. That the order of Government alluded to in the representation, does not in my opinion give the Captains any power, independent of the Major; that if it did so, it would establish anarchy."

"I am Sir, &c. &c."

To The Honorable Warren Hastings Esq.

"Elmutchell, April 29th 1781.

"DEAR SIR

Col. Pearse
solicits Re-
gulations to
define
Ranks and
duties.

"Let me entreat you, to relieve me from intestine broils, which nothing but regulations of the same nature as those I sketched out can do; for we are at A, B, C, and seem to scorn to combine them, even in syllables."

"The appeal is not come to my hands yet, though announced so long ago; I hope to get the Regulations before it begins its journey; not that I conceive that it will make any alteration in the essential parts of my orders, but because I told the officers there would be Regulations to settle every dispute: yet they would not believe me or postpone their wrangling, and pay attention

Col. Pearse
attributes
great part
of the de-
sertion, to
the dis-
putes
amongst his
officers.

to their duties."

"I attribute great part of our losses by desertion, since the sickness, to these disputes; for, had the wranglers been employed in comforting the Sepoys, instead of disputing; the minds of the men would have been eased, and I should not have been forced to record

their disunion, by calling upon them, in orders, to A. D. 1781. unite."

"Yesterday I was troubled with a new subject ; a Major gave orders that the Battalions of his Regiment should not go out to exercise, or fire, without application being made to him. Now, in strict propriety, no Regiment or Battalion ought to go out without application being made to the Commanding officer of the line, and certainly not to fire, for fear of alarm ; and he ought to give it out in orders, that any alarm may be prevented. But the system is to abolish the Majors, by resistance to every part of their power, that the old system may revive with plenitude of emolument. My answer to the reference, was a full confirmation of what the Major had done ; so now they have fresh matter to appeal about."

"I wrote to the Council by the ship Hastings, Tarrier, on the 26th, to tell you, that I was marching on to Ellore, and that I should want money."

"I do not hear a word of the Mahrattas, which concerns me ; for if they do not join the Army in May, they never can : as the Kistna will bar their junction. Of course I do not know who is to command them, but because I much want their aid, and wish to expedite their march, I have to-day written to Rajah Ram Pundit, telling him, that I had the pleasure to hear of peace being settled between Berar and the English ; that I was to be reinforced by 2,000 of their Army, and that I had been ordered to halt for them ; that I did stop at Vizanagram for ten days, and am now moving on the Ellore, where I hope they will join me ; and I go thither, that every thing may be ready by the time they arrive : I begged to know who is to command the

A. D. 1781. Mahrattas, and to be apprized of the day they set out, and the marches they intend to make. I hope all this is right."

"Sitteram
Raz makes
Col. Pearce
a present of
an Elephant
&c.

"Sitteram Raz presented me with an Elephant, two Camels, a Palanquin, Dress, and some Rockets; all of which I received in the very state in which they were presented, to his great astonishment; for he expected that I should have done, as has been customary here generally; that is, should have sent back the ostensibles, and have received the equivalent in money. It might have been more consistent with my actual poverty to have done so, but not with my credit; so I ride on the Elephant, as I did before, on one I purchased, for ease on so long a journey."

"Dear Sir, if any thing is wrong, tell me so in plain terms. As to conforming to a law, made to prevent a man's pulling off his hat, none but Clavering could ever think of it; not if he had ever seen India, or knew any thing of the manners and customs before he was sixty. The present to me was mere civility; I neither had the power to do him good or evil; therefore could never make him a return, but by doing his present the greatest honor I could: and as I judged taking the articles as they were given, and appearing in the dress itself, to be the mode, I did so. That he felt pleased, his words, and actions all shewed; each of my family got a horse and a dress. I tell you all this to prevent others doing so, for it may be magnified into a great present; true, had I taken the money, it would, according to the mode of valuation on such occasions, have been about 15,000 Rupees; but an Elephant &c. you know the actual value of, and the expense of keeping them."

"We lost 31 men on leaving Vizanagram. I wrote A. D. 1781 to Sitteram to get them, but he did not seem active, so I halted a day at Soobarum, and told him by letter, that if he did not get me the men, I would pay him a visit at the head of my Army; for the people could not go through his country without being stopped; and therefore if they were not sent back, the world would say that he had entertained them as he had done before. He was at Semachillum, about 6 miles from Soobarum. Kenneway,* went to talk over the business, and to see the temple; but I would not go to see him there, as I was offended at the loss of my men, and had reason to believe that he had really got them. He was very much concerned at it, and returned to Vizanagram to find the people; and he promised to send them, dead or alive. The Lieutenant who commands his troops, is set upon the same work by him; so either they will be found, or it will be clear, Sitteram has them not, and this is all I want to know: and after all, I would not have given myself a moments trouble about them, but to prevent impertinences."

"I rejoice much that you have accomplished your wish with respect to Berar; but I really wonder at your patience in suffering such a man as Hickey, to publish loads of abuse every Saturday; we do not get the paper here, nor have we for these six weeks, but we hear of his abuse from other quarters, with the same expressions of astonishment. It is true, the man himself is not the author, but some pitiful fellow who dares not avow his insolence, and wishes to stab in the dark. Yet still, such a thing as that Gazette, in such a place as this, is not allowable; and such, good Sir, was my opi-

* Col. Pearse's Persian Interpreter.

A. D. 1781. nion when you too readily agreed to the first publication of a news paper ; I then told you, that the year would not pass, before it became the channel of personal and public abuse, and it is so."

" I am Sir, &c. &c."

To be continued in our next.

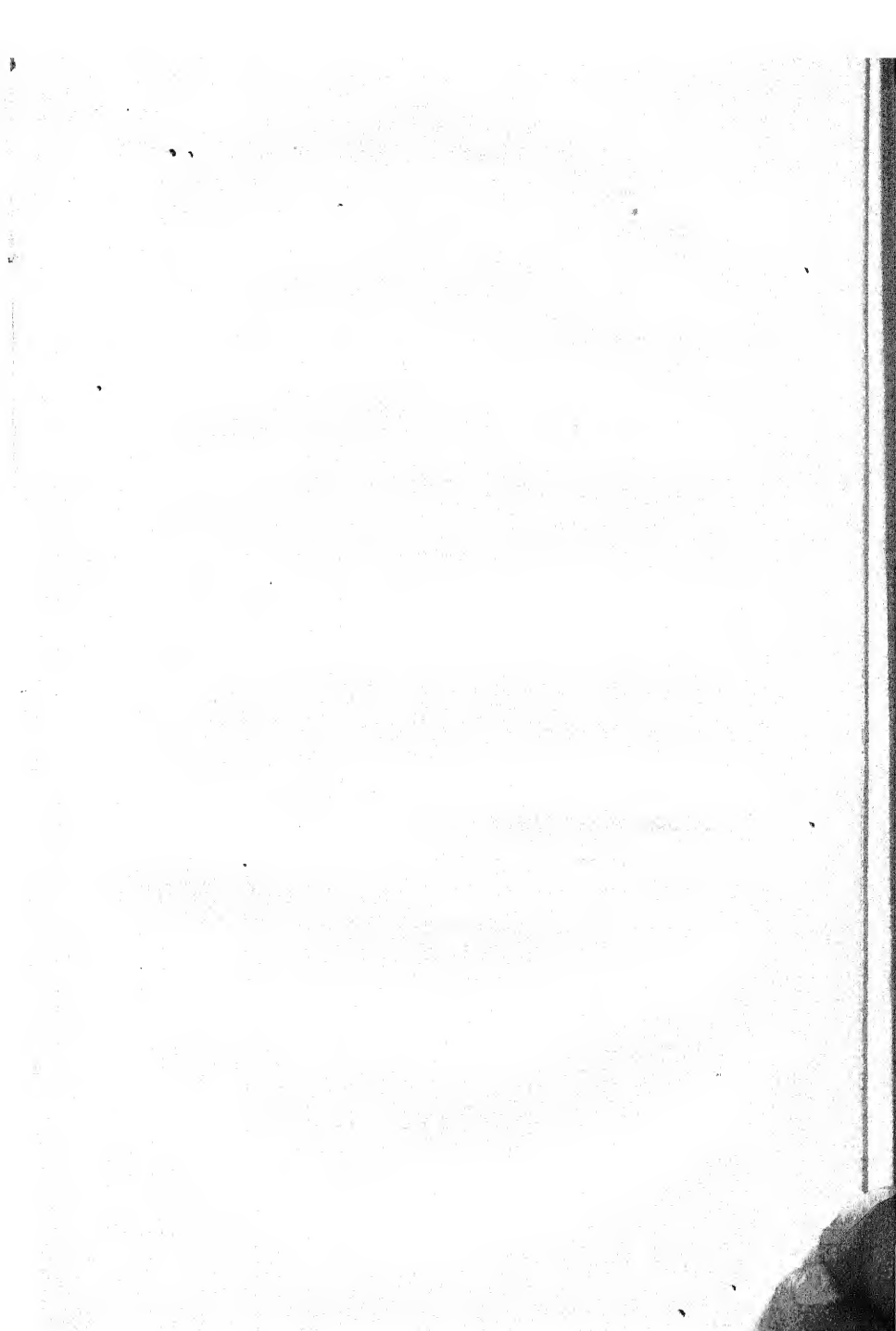


PLATE. 4.

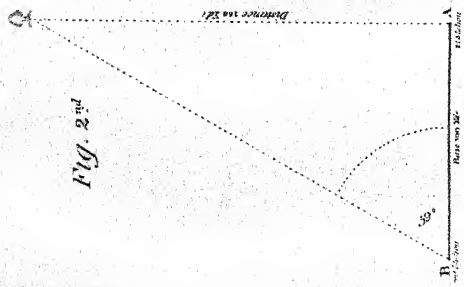


Fig. 2nd

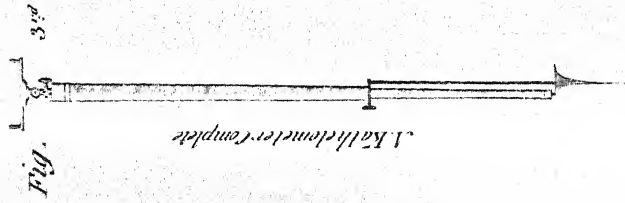
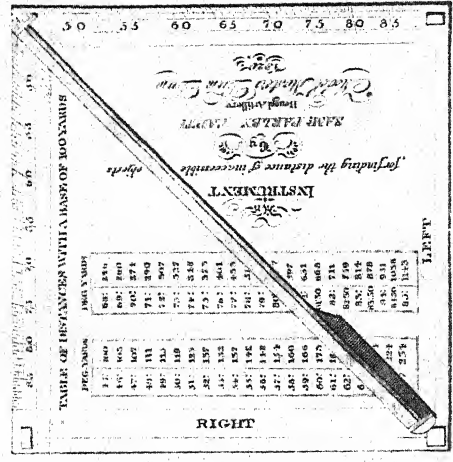


Fig. 3rd



ARTICLE II.

Description of a Kathetometer, or an Instrument for finding the distances of inaccessible objects; by Captain SAMUEL PARLBY, Artillery, Model Master, Dum Dum. PLATE IV.

THE KATHETOMETER* is an Instrument for finding the length of the perpendicular side of a right angled triangle, and is applicable to the purpose of finding the distances or heights of inaccessible objects from a given station.

The Instrument consists of a graduated brass plate, provided with a moveable Index, as represented in figure 1 of the engraving attached. The plate is attached to a staff by a joint or screw, as represented in the 3rd. figure, the staff fits into an iron foot or socket, having a point which can be easily thrust into the ground to fix the Instrument steadily, and the latter also may serve as a weapon of defence to the carrier in case of need.

To Use the Instrument in finding Distances.

Fix the iron foot or socket in the ground at any point from whence you wish to ascertain the distance of any inaccessible object: this point is to be called the first station.

* The name is derived from *Káthēros*, a perpendicular line, and *μέτρον*, a measurer.

Place the staff of the Instrument in the socket, with the hollow in the ferrule of the staff upon the iron point of the socket.

Turn the Instrument round until you can see the distant object through two of the fixed sights upon the face of the Instrument, so that either the line marked *Right*, or the line marked *Left*, be the line of sight towards the object; these two lines are at right angles to each other. The reason of their being marked *Right* and *Left* will be explained.

To find the distance of the object it is necessary to measure a base line, as A B figure 2nd, from the first station A. This base may be measured either to the right or to the left as the ground suits.

When the Instrument is so placed that the object, of which the distance is desired to be known, is seen directly through two of the fixed sights, turn the pinching screw of the ring of the socket, so as to fix the staff steady; the Instrument is not to be moved or touched again until the base is measured, for which purpose it will be necessary that an assistant should move out to the distance of about 150 paces in the proper line of the base, and there plant a staff, or stand himself.

A certain quantity of base is then to be measured, either by pacing, or by a rod, line, or chain; if possible, making the base 100, 150, or 200 yards for mean distances; but where the distance of any very distant point, such as may occur across a channel, broad river, or bay, is to be ascertained, the length of the base should be considerably extended, so as to prevent, if possible, taking a greater angle than 75° from the second station B.

The base being measured, the Instrument and its socket are to be taken to the end of the base B, which

will be called the second station, previously observing to plant a staff at the first station.

The Instrument being placed at the station B, direct the eye through the sights on the line marked left to the staff at the station A, if the base is measured to the left, and fixing the staff of the Instrument steadily by means of the pinching screw, gently move the moveable Index until you see the object, whose distance from A is desired to be known, distinctly through it—observe the degree against the flat side of the Index, and whatever distance is placed against that degree in the Table of distances, is the distance of the object from the first station, supposing the measured base to have been 100 feet or yards. If, however, a base of only 50 yards was measured, half the distance given in the Table will be the distance of the object; if 150 yards was the length of the base, add half the quantity of distance given in the Table to itself, and the sum will be the distance of the object; or if the base was 200, 300, 400, &c. multiply the distance given in the Table by 2, 3, 4, accordingly, and the sum will be the distance of the object from the first station. In the example given in the plate, the distance of the Tree from A is 166 yards, because the angle found at B was 59° , and 166 is the distance given in the Table for that angle with a base of 100.

To Use the Instrument in finding Heights.

To find the height of any object, turn the plate of the Instrument so that its face is in a vertical plane, and the line marked left in an horizontal direction, or rather in a line with the base of the object whose height is desired to be known. If the distance of the object from the observer is not known, it must be previously found by

observation with the Instrument, and this distance, if not horizontal, must be reduced by the reduction Table No. 1.

Observe the angle of any point of which you wish to know the height, through the sights of the moveable Index, observing that the degrees must be counted up to 45° in taking elevations: for instance, where 85° is engraved, suppose it to be $5^\circ-80^\circ$ to be $10^\circ-75^\circ$ to be 15° —so on—to 45° . Having observed the angle, look at the Table of heights No. 2, and if the base be an uneven number say,

: 100.

:: Distance given in the Table for observed angle.

:: Observed base,

: A quantity which will be the height of the object.

If the length of base, as reduced by Table No. 1, was 100 yards, the distance given in the Table on the plate for the observed angle will be the height in yards: the same rule must be observed with extended bases, as in measuring distances.

The Tables, being Tables of Tangents, may also be applied to many other useful purposes:—

For instance, a gun is mounted on a tower, 46 feet above the plain of the country, and the carriage is so constructed that it will allow the gun to be depressed 30 degrees; when the gun is at this extreme depression, how far will the shot strike from the foot of the tower when the gun is fired?

The complement of 30° is 60° ; observe the distance in the Table on the Instrument against 60° , then say,

as 100 feet,

: 173 feet,

∴ 46 feet the height of the Gun above the plain.
79½ feet nearly, which is the distance at which the shot will strike the ground, from the foot of the tower when depressed 30 degrees.

REDUCTION TABLE.

No. 1.

A Table to shew the quantity to be deducted from the distance found at any Angle of Elevation or Depression to reduce it to true Horizontal Distance, with a Base of 100 Yards.

Degrees.	Deduct.	Degrees.	Deduct.	Degrees.	Deduct.
5° 45'	0 ½	23° 45'	8 ½	33° 25'	16 ½
8° 10'	1	24° 30'	9	33° 55'	17
9° 55'	1 ½	25° 10'	9 ½	34° 25'	17 ½
11° 30'	2	25° 30'	10	34° 55'	18
12° 50'	2 ½	26° 30'	10 ½	35° 25'	18 ½
14° 4'	3	27° 10'	11	35° 55'	19
15° 10'	3 ½	27° 45'	11 ½	36° 25'	19 ½
16° 15'	4	28° 20'	12	36° 55'	20
17° 15'	4 ½	28° 55'	12 ½	37° 20'	20 ½
18° 10'	5	29° 30'	13	37° 50'	21
19° 30'	5 ½	30° 5'	13 ½	38° 15'	21 ½
19° 55'	6	30° 40'	14	38° 45'	22
20° 45'	6 ½	31° 15'	14 ½	39° 15'	22 ½
21° 35'	7	31° 45'	15	39° 40'	23
22° 20'	7 ½	32° 20'	15 ½	40° 5'	23 ½
23° 5'	8	32° 50'	16		

TABLE OF HEIGHTS, WITH A BASE OF 100.

No. 2.

Degrees.	Height.	Degrees.	Height.	Degrees.	Height.
1°	1-7	16°	28-7	31°	60-
2°	3-5	17°	30-6	32°	62-5
3°	5-2	18°	32-5	33°	65-
4°	7-	19°	34-4	34°	67-5
5°	8-7	20°	36-4	35°	70-
6°	10-5	21°	38-4	36°	72-7
7°	12-3	22°	40-4	37°	75-4
8°	14-	23°	42-4	38°	78-1
9°	15-9	24°	44-5	39°	81-
10°	17-6	25°	46-6	40°	84-
11°	19-4	26°	48-8	41°	87-
12°	21-3	27°	51-	42°	90-
13°	23-	28°	53-2	43°	93-2
14°	24-9	29°	55-4	44°	96-6
15°	26-8	30°	57-57	45°	100-

N. B. This Table is also a Table of Distances, with a Base of 100 from 1° to 45°.

Fifty of these Instruments have been made up in the Model Establishment by authority of the Military Board for use in Bengal, and they are now to be dispersed to the different magazines in the field.

As some apology for the want of finish which may be observed in them, the inventor begs to remark that the above Kathetometers were made up under great disadvantages; the Model Establishment at the time of making them was in its infancy, and the workmen were uninstructed; the requisite tools for such work were wanting, and substitutes for them were with difficulty and but imperfectly supplied. The graduation was also entirely performed by the hand.*

The Instrument has not, the inventor is aware, much claim to merit for invention or originality, and to extreme accuracy it has no pretensions whatever. If telescopic sights, small reflecting mirrors, and spirit levels had been employed, as they might have been to insure this end, the Instrument would have become cumbersome, easily deranged, and probably have very soon become useless from rough usage.

The sole pretensions of the inventor in the present Instrument rest, in having produced a cheap, portable, and simple Instrument for use in the field, where moderate distances are desired to be found, in cases when, mathematical exactness and nicety of observation are not required.

Dum Dum, 2nd. April 1822.

☞ In the engraved Table of distances on the Plate only whole numbers are used, the decimals, where the distance ought not strictly speaking, to be a whole number, being omitted to prevent mistakes.

* Since these Kathetometers were made, a small dividing Instrument has been constructed in the department, and any Instrument can now be divided with very considerable accuracy.

ARTICLE III.

Remarks on the Native Invalid Establishment, and on the formation of the Committees for Invaliding the Native Soldiers of the Bengal Presidency.

NOTWITHSTANDING the great liberality of the Government, in providing for their worn out Native Soldiers, and the present extensive Invalid Establishment, kept up at a very great expense to the State; it is well known to every officer who has attended to the subject, that there are many individuals in the ranks of every Native corps of the line, who are but little capable of performing active duty in the field; and that the Invaliding Committees, as at present constituted, do not deem men fit objects for the Invalid Establishment, if they can in any way, no matter how, be made to get over common Cantonment duty for another year.

Having constantly served with a regular Battalion, and from the situation I have filled for 8 years, having had many opportunities of noticing the present method of transferring men to the Invalid Establishment, with the effects produced by the unwillingness of the Committees to transfer any but men absolutely in the last stage of infirmity; I am induced to offer the following observations, in the hope they may not be altogether unworthy the attention of those, who feel an interest in the Native Army.

. I am fully sensible, that in suggesting any plan, calculated to increase the number of men transferred from the corps of the line, it is necessary to guard against any increase of expense in the Invalid Establishment ; and I am not without hope, that what I am about to propose, may be calculated to reduce that expense.

It will be generally allowed, that if all the Commissioned, non-commissioned officers, and privates, who had served 15 years, and who, from wounds, debility, or other infirmity, are not fully equal to the performance of all the duties of corps of the line, were transferred from the regular branch of the service, the general efficiency of the regular corps would be greatly advanced ; and that there are many Individuals of this description, in every corps of the line, will be clearly established by a reference to the Commanding officers of regular corps.

The evil here alluded to, chiefly, if not entirely results from the anxiety of the present Invaliding Committees, to perform what they firmly conceive to be their duty ; although I confess, they have always appeared to me, to take a very erroneous view of that duty, and to consider, that they were assembled, rather for the purpose of calculating how much longer an old Soldier might be made to hang on in a corps, than for the transfer of men, who might not be fully fit to perform the duty required from regular troops.

This feeling, on the part of the present Invaliding Committees, prevents the transfer to the Invalids, of any but men absolutely worn out ; and therefore many weak and infirm men remain in their Battalions, receiv-

ing the full pay of their ranks : and though willing to perform to the best of their ability, the duty required of them, a day's hard duty of any kind, would send them to the hospital.

With a view therefore, of obviating the present evil, I recommend, that three field officers, or in default of field officers, the three senior Regimental officers present at the station, be appointed members of the station Invaliding Committee. A Committee thus constituted, of officers and medical staff, would act with more freedom than the present Committees, who certainly take too confined a view of their duty, and transfer none but men who have some disease : as if length of service and exposure, were not in themselves sufficient to impair the bodily strength of the Soldier, and render him wholly unfit for active duty.

The adoption of this plan for the formation of the Committees, would increase the number of annual transfers ; and to prevent these men from becoming a burthen to the state, as they would, if transferred to our present Invalid Battalions, I suggest the following method for rendering them useful, and at the same time less expensive.—

I propose, that the men transferred as above recommended, should be drafted into the provincial Battalions, where they would be still employed in an useful and profitable manner ; and I am quite certain that this method of disposing of men not fully fit for active duty, would not in any way lessen the efficiency of the pro-

(Note) Of course our correspondent means to imply, from what follows, that these officers are to act conjointly with the usual Medical Staff, forming station Invaliding Committees. Editor.

vincial corps; but on the contrary, have a tendency to improve them, and render them more worthy of trust, as they would be filled with old Soldiers, trained in the regular service, and who had been employed on duties of every description, instead of the numerous idle and dissolute characters, who at present find employment in them.

The present Invalid pay, being higher than that of the provincial corps, it might be advisable to grant the full Invalid pay to all such men, as might be Invalided on account of wounds or hurts, received in the execution of their duty; as also, to such privates as might have served twenty-two years, and non-commissioned officers, who had served 7 years in the rank they held at the time of their transfer: the Native commissioned officers continuing to be Invalided on the present rate of pay.

The number of men that would be transferred on this plan, after the first year, would probably amount to, (but certainly not exceed,) ten in each Battalion of the line: and with the view of securing vacancies for this number, I recommend that one of the Invalid Battalions, (at present little calculated to perform any duty,) should be reformed; retaining the most able bodied and effective men of the present Invalid Establishment, and be completed from the wounded men, and the oldest Soldiers Invalided; and then expected to conform in every respect to the usages of the Regulars, and be made to assist in the performance of all Garrison duties, but not required to march as escorts with treasure, or with prisoners. That an Invalid Battalion, composed of the most effective men at present on that Establishment,

and the men above recommended to be selected from the transfers, would be fully capable of performing Garrison duty, there can be little doubt; and if some of the European Invalid officers, who, under the existing system are in many respects lost to the service, were posted to this corps; it might be employed with effect, in many situations - at present requiring regular troops, and in occupying their places during the progress of a relief, or when required in the field.

All recruiting and promotion in provincial corps would of course cease; and the young men of good character, now belonging to them, should be permitted to volunteer for the corps of the line: the officers commanding the divisions, to which the provincial Battalions belonged, rejecting such men as they might not deem fit for the regular corps.

I have to request a place for these remarks, in the next number of the Military Repository, in the hope they may attract the attention of some one more capable of bringing the subject to the notice of Government, than your obedient servant.

AN ADJUTANT,

Bengal Native Infantry.

April, 1822.

ARTICLE IV.

Mortar Eprouvettes, for proving Gunpowder.

To the Editor of the Military Repository.

SIR,

CAN any of your correspondents inform us, whether the Mortars commonly called *Eprouvettes*, which have been for some time used for proving powder at the manufactories of Bengal, are also in use at the other Presidencies; and can they state what advantages are expected in using them for this purpose?

It may perhaps be first necessary to describe what is meant by this *Eprouvette*; for I believe it is a name generally applied to all instruments so employed, and not peculiar to the one I am enquiring about. The Mortar I saw, was at the Allahabad manufactory, and was an Iron Mortar on an Iron bed, of the kind which I think is commonly called Gomer's. Its chamber is not formed in a recess at the bottom of the bore, as is the case in common Mortars; but from the part where the bore of the common Mortar begins to round to receive the shell; this is carried in a conical shape to the bottom of the chamber, so that the shell when let into the piece, wedges itself into the beginning of the cone. To the bottom of this cone was fitted, a false chamber, cut in brass, and exactly adapted to hold the proof

charge of 3 oz.* and it was retained in its place, by a strong iron screw.

The effect of this construction is, that the shell has no windage, or very trifling if any; and the chamber being so contrived as to just touch the shell when loaded, and the powder in it, is confined to a space just equal to its own bulk; and the shell receives the full impulse of the elastic fluid on the first inflammation. The Mortar too, is so fixed as to prevent recoil.—Hence the shell was thrown to a much greater distance than from a common Mortar; the proof range being from this 247 yards, and from the common 63.

I confess however, in this I can see no advantage; whilst the following experiments which I saw tried with great care, make me to think, that it is liable to give erroneous results. The experiments were suggested from the following circumstance.

The Military Board had ordered some of the powder of the manufacture of the *bad* years, which had been found much under proof, at some of the Magazines, to be returned to the Allahabad manufactory, to be re-made; and although the proof taken at the Magazine was very short, if I recollect right not above 40 yards, yet it gave the full 247 from the Epreuve. Upon this, some powder that had stood proof, in the common way was taken, and a common Mortar and the Epreuve, loaded at the same time, with the same quantity of powder; shells of the same weight and diameter, and in fact, every precaution used, to obtain nearly similar effects, as far as regarded arrangement. They were fired together 3 times, and the proportion of the mean ranges, was exactly 63 to 247 yards.

* The Editor believes this should be 2 oz.

Powder was then taken, which had on a previous proof, given a range of not quite 20 yards I believe—the two Mortars were again loaded with the powder, and fired as before; yet, though the previous short proof was confirmed from the common Mortar, the Epreuve gave more than the 247 established as its proof range, and this 4 or 5 times in succession.

I am sorry that I am not possessed of the minutes of this experiment, which prevents my stating particulars; but the general result I am certain, is correctly stated as it happened on this occasion, and seems to indicate an objection to our mode of proof for powder, which may be of serious consequence, and which at all events, seem to make further experiments very desirable, before future confidence can be placed in this machine.

I am Sir,

*On the Banks of the
Ganges near
Allahabad, 20th Feb. 1822.*

Your Obedient Servant,
A BENGAL ARTILLERY-MAN.

(Note.) We have been given to understand that an 8 inch Gomer Mortar is in use at Madras for proving Gunpowder; but that a particular nicety is observed there, in suspending the bag containing the small charge of 2 or 3 oz. as nearly as possible in the axis of the piece, by means of a piece of wire passing through the vent, to which wire the cartridge is attached. We shall however, most happily record any communications on this important subject from the sister Presidencies, in our future pages. We are of opinion, that the proof of Gunpowder newly made, answers no further purpose, than for the satisfaction of the agent. The permanent and *bona fide* proof of the powder, should not take place until the material has been in store at least a year; and portions of the powder to be proved should then be packed in cartridges, and exposed a few days in a Laboratory tent to the atmosphere, to ascertain that no change takes place from de-composition.

Some English Gunpowder, was tried at Dum Dum about 3 years ago, which had been landed from a man-of-war 11 years previous to the trial, and it was found excellent, in strength and appearance, exceeding the Bengal powder recently made.

This trial however, was made before the new Machinery was erected by Captain Galloway, the present Agent at Ishapore, of the good effects of which, we believe, the most sanguine expectations are entertained.

The Eprouvette in use at Ishapore this season, is an 8 inch Iron Gomer Mortar: half of its bore is a cylinder, the remainder being the frustum of a cone. No moveable chamber is used.

With 2 oz. of Gunpowder, the proof range is established at 63 yards. The average of actual ranges of this season, is about 86 yards: of last year, 96 yards.

The shells (of which two are used) are made of bell metal, and having become irregular on their surfaces, and the mortar's being in some degree worn in the bore at the point of contact with the shells, may account for this difference.

*The Dimensions are as follows :**

	Ft.	Inch.
Exterior length of the Mortar	1..	9.5
length of the bore	1..	4
Do. of cylindrical part of do.	—	8
Do. of frustum of cone	—	8
Diameter of the cylinder	—	8.025
Do. of the small end of the frustum	—	3.8
Do. of the shells	7.93 Inch &	7.9
Thickness of metal of the muzzle	—	4.2
	cwt. qr. lbs.	
Weight of the Mortar (No. 318)	8..	1..4
Do. of the Bed (Iron)	11..	1..10
	lbs. oz.	
Do. of the shells	66 14 and	— — 67..2 oz.
The proper weight of the shells ought to be	—	— 68
The Mortar is marked, "greatest charge"	—	2 lbs.
	Range	2000 yds.

* These dimensions have been furnished by a friend, who took them when on duty at Ishapore.

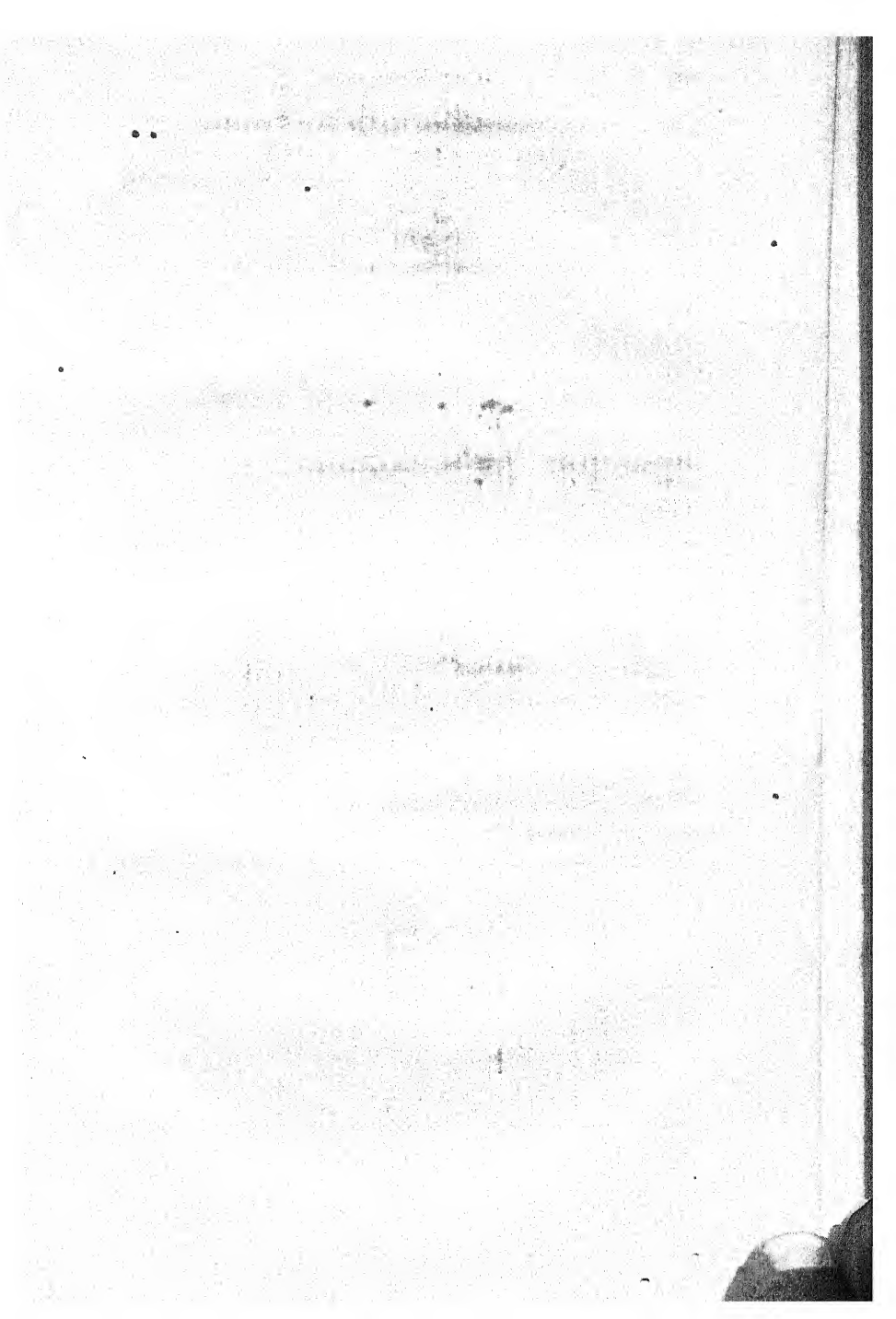
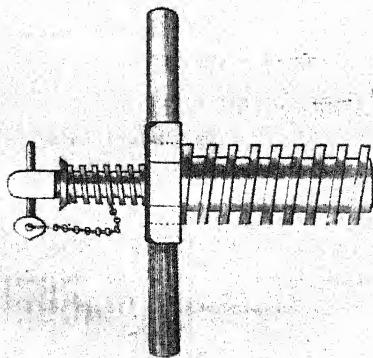
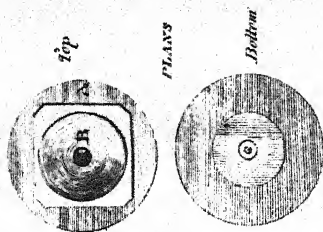
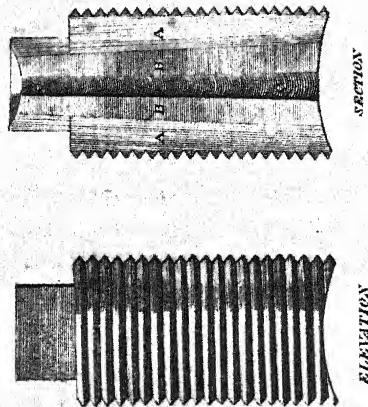


PLATE. 3

*A Double Elevating Screw for
FIELD ORDNANCE*



*A New Vent for
ORDNANCE*



ARTICLE V.

Description of a new Vent, and a double Elevating Screw for Ordnance; of which Engravings are given in PLATE V.

IT is well known to artillerists, (without investigating the causes here,) that the vents of Ordnance, particularly those of heavy iron guns, become enlarged after much firing from them; and this serious evil some times extends so far as to render a gun unserviceable, until the tedious operation of *bushing*, (as the applying a new vent is vulgarly termed,*) can be effected.

The object of the inventor of the present vent, PLATE v, is to supply a species of *bouche*, which by its construction, will admit of the speedy exchange of an unserviceable for a serviceable vent; without removing a gun from its carriage in the field or battery.

This vent, is also well adapted for a course of practical experiments with cannon shot; to ascertain the quantity of loss of the impelling fluid at every discharge, through vents of different orifices; and, in fact, it was in the course of preparation for an experiment of this description, (which the Military Board have liberally allowed me to pursue), that the invention originated.

The Elevation, PLATE v, shews the exterior form of an iron or steel screw, which is cut with a thread corres-

* A corruption from the French word *bouche*.

ponding with that in the metal of the gun into which it is to be screwed, as the copper vents now are in our present Ordnance.

The iron screw is bored through longitudinally, with a tapering hole in the proportion, as represented in the section: the largest diameter being at the bottom.

AA, shews the thickness of the iron; BB, is the section of a copper bolt,* having a small cylindrical hole CC, drilled through it the proper size of the vent; this bolt is to be driven hard into the iron screw, so as to fix it firmly: of course the copper bolt is to be previously turned to the proper taper, and it may be slightly ground into the iron screw, by means of a little fine sand.

The cup is counter-sunk with a bit, as shewn in the plan of the top, to make a cup to receive the thumb of the man serving the vent; and the bottom of the screw is cut off inside the bore of the gun, to the curve of the cylinder, by means of a boring tool.

The head of the iron screw is filed square, to fit a wrench which should accompany every gun; and several spare taper bolts, properly fitted to the screw, are to be sent when the gun goes on service.

Supposing a gun thus previously fitted up, before leaving its magazine or dépôt, whenever from subsequent service the vent becomes enlarged or irregular, the iron screw is to be taken out of the gun, the old bolt driven out with a round punch, and a new one

* An iron or steel bolt will be found still better; copper has been proposed as it is found to be a more durable metal than iron for the vents of guns; but with the present vent, the exchange of a defective one is so quickly effected, that the use of either metal is immaterial.

hammered in with sufficient force to fix it firmly; the bolt being protected, by means of a piece of hard wood, from immediate contact with the hammer.

The screw being again fastened into the gun, it will be ready for action; and the whole operation of changing from an unserviceable to a serviceable state, ought not to require more than 10 minutes: whereas, in the present mode of bushing even a brass gun, it can hardly be effected in two days.

By unscrewing this vent, a gun can be rendered immediately unserviceable to an enemy, to whom it must from necessity be abandoned; and it will become serviceable again, upon its being retaken and the proper vent screwed in.

If time will not permit to unscrew the iron, the copper bolt may, by a smart blow with a punch, be driven into the cylinder, leaving the large orifice in the iron screw, which would effectually weaken any subsequent discharge from the gun; or should the enemy come by surprise upon the gunners and spike the vent, a new bolt can with facility and quickness be applied on recovering it.

This vent has been fixed to a brass 6 Pr. at Dum Dum, and 3 rounds were fired from it with proof charges: a set of bolts, with vents of different diameters, have also been fitted to it for the experiment mentioned above.

The Double Elevating Screw.

John Bebb Esq., Chairman of the Honorable Court of Directors, in the year 1817, delivered into my hands a small wooden model of a double screw, something similar to that represented in PLATE V, saying at the same time, that I might probably be able to apply it to some

use on my return to India. The model had been sent to him by a person some years before; but both the name of the individual, and the intention for which the screw was offered, could not be recollected.

On my arrival in India I prepared a model of an Elevating Screw upon this principle for Ordnance, and His Excellency the Commander in Chief, condescended to order that it should be adopted in the service in Bengal. I was called upon by the Military Board to prepare some pattern screws: accordingly, a 13 inch mortar screw, an 8 inch mortar screw, and one for a 6 Pr. field gun, were made up; the two last were applied to Ordnance, and used through the whole of the practice in the season of 1820.

The following advantages are gained by the adoption of this screw:

1st. Great quickness in elevating or depressing a piece of Ordnance—

2nd. The shortness of the screw when it is turned down, so as to enclose the whole of the upper screw within the lower one, (which is of greater diameter;) a circumstance which tends greatly to its preservation from the weather, and from accidents on a march: this shortness is also of the utmost importance in the recoil of mortars mounted on low cheek beds, when fired at low elevations.—

3rd. The lever handles of the double screw, rise in turning to the right, or elevating, and thus save the hands from liability to injury, which frequently happens in using the common elevating screw; the handles of the former never coming near the box containing the female thread of the lower screw, except at the extreme elevation of the piece.—

4ly. There is considerably less friction with the double screw, in consequence of there being only inclined planes moving over each other; while in the common screw, the friction of the under horizontal surface of the box containing the female screw, (to which the lever handles are attached) is very considerable.* This is an advantage with very heavy Ordnance, but is hardly worth consideration with light field pieces; where, indeed, the having less friction may be an objection, in consequence of the gun running down with more facility with a double screw; and to prevent this, I had applied a pinching screw, pressing upon the threads of the lower screw, and thus effectually preventing the motion of the screw downwards; but this injures the brass boxes of the screw exceedingly, and ought not to be adopted; a moveable wedge, sliding between the gun and its bed, or carriage, being far preferable.

SAMUEL PARLBY,
Capt. Bengal Artillery.

* From not having taken into consideration the friction of the lower surface of the box of the common Elevating Screw, I was in expectation, before trial, that the friction of the double screw would have been greatest: especially as the screws move in opposite directions.

ARTICLE VI.

*New formation of the Solid Square against Cavalry,
by an Officer of the Bengal Native Infantry. PLATE VI.*

CAUTION.	WORDS OF COMMAND.	BY OFFICERS OF COMPANIES.
The Battalion will form the Solid Square on the 4th and 5th Companies by filing of grand Divisions.	4th and 5th Companies outwards face.	4th <i>Company</i> leading file, Right wheel—quick march. 1st Sub. Div. halt, front. 2nd Sub. Div. Do. Do. 5th <i>Company</i> leading file, Left wheel—quick march. 2nd Sub. Div. halt—front. 1st Sub. Div. Do. Do.
	Remaining Companies inwards face, quick march.	<i>Right Wing.</i> 2d Grand Div. halt, front. 1st Grand Div. Do. Do. <i>Left Wing.</i> 4th Grand Div. halt, front, outwards face. rear Grand Div. halt, front, outwards face.

DEPLOYMENT OF THE SQUARE.

The Battalion will deploy on the 4th and 5th Companies.	4th and 5 Companies inwards face.	4th <i>Company</i> leading file Left wheel.—quick march, halt, front, dress.
	Remaining Companies right face, quick march.	5th <i>Company</i> . leading file right wheel, quick. march, The same words of Command as in army Regulations for deploying close column by grand Divisions.

N. B. Fig. 1 PLATE 6, represents the square completely formed, with the position of the troops in line before the movement. Fig. 2, and 3, represent the companies moving, to complete the formation of the square.

For Infantry to form the Solid Square against Cavalry
By an Officer of the Bengal Native Infantry

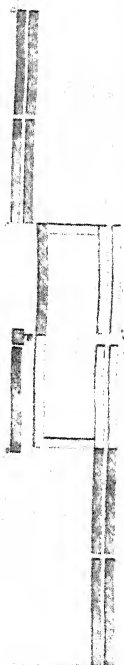


Fig. 3

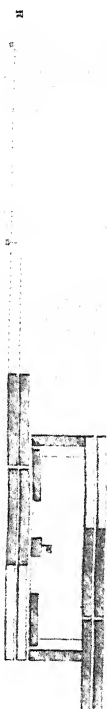
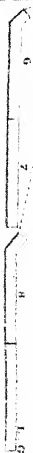
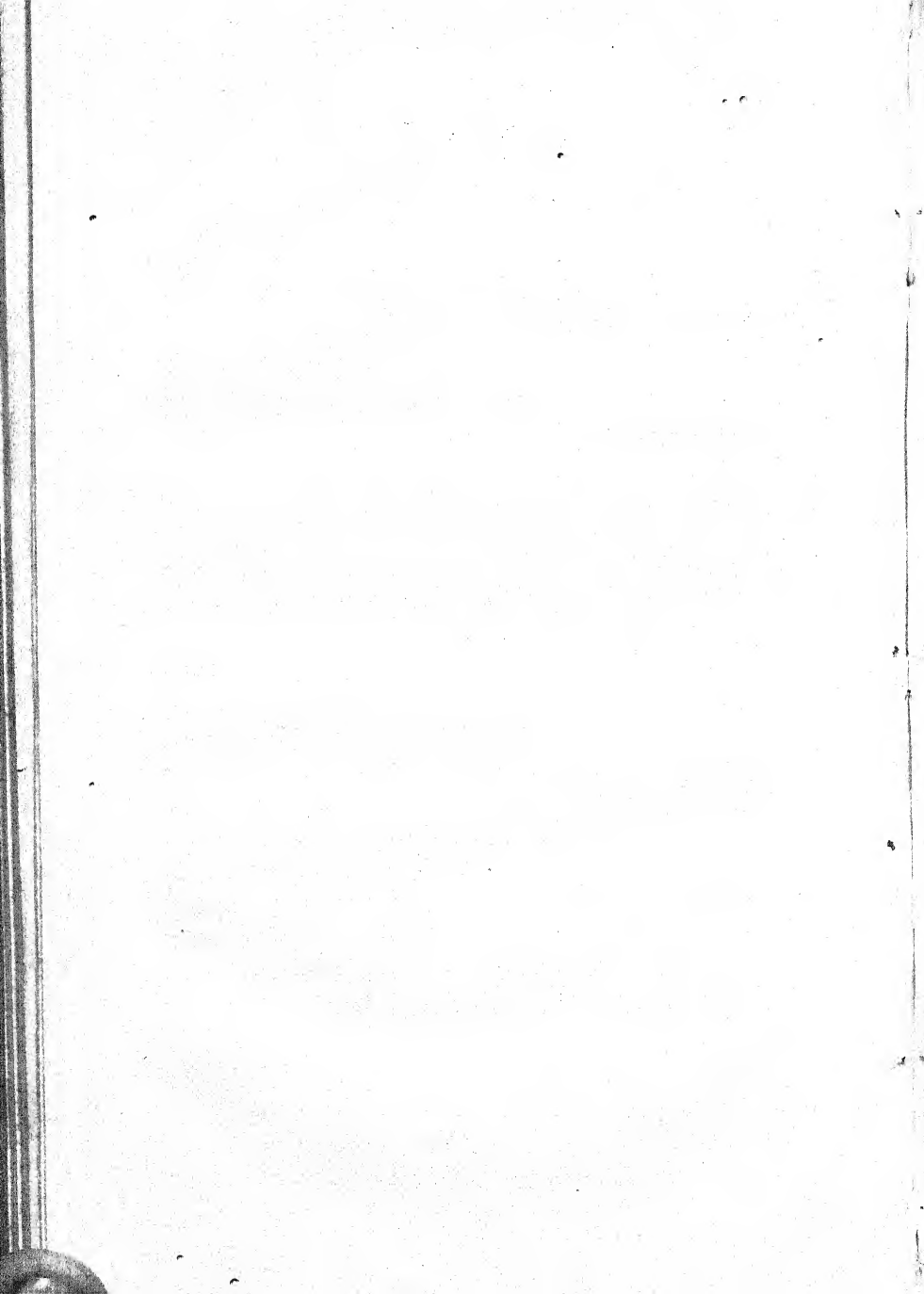


Fig. 2



Fig. 1





ARTICLE VII.

Proposal of a new projectile for cannon: having equal weight with a spherical shot of the same diameter, but opposing only one third of the surface to the resistance of the air, and having the properties of a rifle-shot, without the defect belonging to it when fired at an high elevation. PLATE VIII.

To the Editor of the Military Repository.

SIR,

The perusal of the 8th Article, p. 129 of your first number, has suggested to me a form of shot, which I am in hopes will add to the power of Artillery, and which I beg therefore, you will oblige me by publishing. The theoretical advantages it possesses will be readily admitted; and, provided there be no practical difficulties, and none of any moment have as yet occurred to myself, it must make its way. But I must not omit a few lines of introduction to do it justice. I have confessed that it was suggested to me by your 8th Article. At first perusal, like most of your readers, probably, I found it impossible not to smile at the idea of a spherical shot, "perforated in three directions through the centre!" that is, having no less than six holes in its surface. How small the chance of one of these perforations coinciding with the line of the shot's flight, so as to answer the intention of its inventor! And even upon this most favorable supposition, how immaterially would it dimi-

nish the resistance of the air, unless the perforations were of large diameter, and if so, what would become of the shot's momentum? More would be lost by want of weight, than would be gained by the diminished resistance of the medium. It is an established fact, that the heavier the material used for shot, the greater is the distance to which it may be projected. The boasted improvement introduced by the French, in their late siege of Cadiz, by which they threw shells to the extraordinary distance of three miles, "it seems, has been effected," (says Dr. Hutton,) "by means of a peculiar piece of ordnance, and by loading or filling the cavity of the shell with lead, to render it the heavier, and thus make it fitter to overcome the resistance of the air." On land service it is seldom required to project shells to so great a distance as one mile; and Dr. Hutton calculates the utmost practicable range of our 13 inch shells, if projected with the velocity of 2,000 feet per second, at somewhat more than $2\frac{1}{4}$ miles. He then calculates what it might be, if the shells were filled with lead, and projected with equal velocity, and states, that they would range nearly to the same distance as these shells of the French; that is nearly 3 miles, if our mortars could effect such a velocity. (See Vol. 3d of his course of Mathematics, p. 301 &c.) I introduce this account, to show the disadvantage which must result from lessening the weight of a shot by the perforations proposed.

The intention, however, of the inventor of the perforated shot, (as far as related to avoiding the resistance of the air,) was nevertheless truly philosophic; and the idea will not be thrown away upon the world in these

days; though, had it been promulgated 80 years ago, before Robins published his *Gunnery*, it would have passed unnoticed. The perforated spherical shot will not, however, do; but if, by following up the idea of avoiding atmospheric resistance, by allowing the air to pass through the body of the shot, some better form can be substituted, which will be at the same time of equal weight with a spherical shot, or greater if desirable, the improvement is obvious and important. Such an improvement my shot professes to be.

I propose to take the same weight, or a little more, of metal as is contained in a spherical shot, and give it the form of a hollow cylinder open at both ends, about 2 diameters in length, or of any other greater or less length that experience may show to be preferable: for it is easy to have any length of a hollow cylinder out of the same quantity of metal, by diminishing the thickness: the heavier the better, if guns adopted in strength to the additional weight of metal be also used. But my immediate object being, to add a new species of shot to the guns already in use, I leave the question of heavier shot for the present, and shall calculate the thickness of metal for different lengths of cylinders, upon the supposition that the weight of a spherical shot of equal diameter is not to be materially exceeded. The rims of the hollow cylinder, I think should be rounded off, so as to form the curvature of least resistance, or such as should be given to the heads and sterns of vessels; and the shot is to be fired with a thick wooden wad, which should be at least one diameter in thickness, as it must be very strong, and, perhaps, to prevent its being driven into the cylinder, and there sticking like a cork,

it may be found necessary to add a plate of metal to the end next the shot.

To all who happen to be aware of the prodigious curtailment of a shot's flight from the resistance of the air, the advantages of a form which, with equal momentum, will oppose only half or one third the usual surface to that resistance, must be evident. In vacuo with a velocity of 2,000 feet per second, the greatest range of projectiles of all descriptions might be (according to Dr. Hutton) $23\frac{1}{2}$ miles! But this is a velocity seldom or never used, and it is a range far greater than we could even wish. One would not desire to throw a shot to a greater distance than a good telescope would enable one to see the enemy; but to be clear out of the reach of his guns, we should have no objection, provided he were within the certain range of ours. But the extreme ranges of shot are at present never used in war, because in extreme ranges there is no calculating the directions of projectiles. It is not worth while to fire a shot, that may fall nearly a quarter of a mile out of its line, in the range of a mile, as may be seen in the observation, p. 279, of Hutton's 3rd volume of Mathematics, and many similar observations which have repeatedly been made by others who have attended experiments on extreme ranges.

Hence it was, that the idea of adopting the principle of rifles to cannon shot, appeared of such importance to Robins, the great father of modern Artillery, who at the end of his tract on rifles, mentions that he had endeavored to contrive some method of accomplishing this great object. Some methods, he hints, had actually occurred to him, but he does not say what they were. The

passage is, I think, well worth quoting, and bears directly, as will presently appear, upon the subject of my paper.

“On some of these methods which have occurred to me, I have already made several experiments ; and there are others which I have more lately considered, and which appear to me infallible. But there are many reasons why I should not now engage in a circumstantial discussion of this kind. I shall, therefore, close this paper with predicting, that whatever state shall thoroughly comprehend the nature and advantages of rifled barrel pieces, and having facilitated and completed their construction, shall introduce into their armies their general use, with a dexterity in the management of them, they will by this means acquire a superiority which will almost equal any thing that has been done at any time, by the particular excellence of any one kind of arms, and will, perhaps, fall but little short of the wonderful effects which histories relate to have been formerly produced by the first invention of fire arms.” To those who have not considered the peculiar properties of the flight of a rifle shot, this will appear, possibly, an extravagant prediction ; and yet if we do but suppose a similar superiority from the introduction of rifle cannon shot, to be effected over the cannon shot in use, as has been effected in musquetry, the prediction will be verified. We might then, perhaps find it as necessary to use telescopes* in laying our guns, as we do in measuring angles with surveying instruments.

* A telescope with cross hairs fixed to a common rifled musquet and adjusted to the direction of the shot, will make any person with a very little practice, hit an object with more precision than the most experienced marksman. See *Article Gunnery, Encyc. Brit.*, page 232.

With this preface, I may now announce another property of the open cylinder, from which, it will be perceived, I also hope to derive great advantage : viz, that it admits of wings inside it, which, if disposed like the spiral feathers of an arrow, or the sails of a wind-mill, will have the effect of making it whirl on an axis coinciding with the line of its flight: and hence, will give it the distinguishing property of a rifle-shot. But this is not all.—There is a general defect belonging to rifle-shot, when fired at high elevations. When the curvature of descent becomes considerable, a rifle-shot no longer revolves round an axis coinciding with the line of its flight, as an arrow does, however incurvated its course may be; but its axis, keeping nearly its original direction, whilst the flight of the shot has become curved, in obedience to the laws of gravity, its original and peculiar excellence becomes lost, and it is liable to deflection like other shot. This defect will not belong to the open cylinder. The wings which I propose to place inside, near the after end, will not only have the effect of giving it the requisite whirling motion, but will also have the effect of keeping its axis in the line

The wings of the shot need not be large, and the smaller the better, provided they answer their intention, since they will undoubtedly tend to diminish the range, though the surface opposed to the air, including the wings, will still be very far less than the surface of a spherical shot of equal weight and diameter. I think it probable, that two very small wings would be sufficient, considering the hurricane that would blow through the shot in its flight. A velocity of 1000 feet per second, is at the rate of nearly 700 miles per hour. A brisk

gale has been reckoned, at 20 or 25 miles per hour; a great tempest at 60 miles per hour; and a hurricane, that carries buildings before it, has been reckoned to travel at the rate of 100 miles per hour: whence we may conceive what must be the resistance to projectiles fired with a velocity more than ten times this last amount, which often happens, that is, upwards of 1,500 feet per second; and hence we may also judge of the importance of diminishing the surface exposed to such a condensed hurricane. It is like taking in a sail in a gale of wind.

I now proceed to detail the dimensions of open cylinders of different lengths.—First, if the cylinder be made one diameter in height, we must deduct a solid cylinder from the centre of it, the base of which must be one third of the area of the whole base, since we know that a sphere is two thirds of its circumscribing cylinder: (thanks to the good ancient, whose name I must beg leave to usurp, for shelter and ornament, at the end of this paper,) the remainder will be equal in weight to a spherical-shot of the same diameter; and the diameters of the cylindric bases, being as the square roots of their areas, will be as 1 to $\frac{1}{3}$, or as 1 to 575, which gives the thickness of metal at 212 of the whole diameter. If the cylinder be made one diameter and a half in height, the proportion of such a cylinder to a sphere of equal diameters, is evidently $4\frac{1}{2}$ to 2, or 9 to 4, and the base of the cylinder to be deducted must be therefore $\frac{9}{9}$ of the whole base, and the diameter will be as 1 to $\frac{5}{9}$, or as 1 to 745 which gives 127 of diameter for thickness of metal.

But though by lengthening the shot, the direct resistance of the air to its flight might be diminished indefinitely, there must evidently be limits to the advantage gained thereby, since the mere friction along the sides, would, at some assignable point in the length, amount to a retarding quantity equal to the gain from avoiding direct resistance. But friction bears a very small proportion to direct resistance, even in small velocities, and in great ones the difference must be immense: for in great velocities a considerable part of the resistance to a shot, is considered to arise from a vacuum, more or less complete, left behind it: whence, in addition to other opposition in front, there is the more or less unbalanced weight of the atmosphere, pressing against its fore surface. In small velocities the inconsiderable amount of friction may be judged of from the flight of arrows. Let us conceive how far an arrow can be shot broadside foremost: that is, with half its surface directly opposed by the air, compared to the distance the same arrow would fly, shot head foremost, when its whole surface would be opposed by friction merely, and we shall readily conceive the inconsiderable resistance of friction compared to that of direct opposition.

Probably the open cylindrical shot might be made advantageously 3 or 4 diameters in length, but I do not calculate further than two diameters at present, and the drawing which accompanies this paper, is in that proportion. Calculation gives the proportions of its outer and inner diameters as 10 to 816, or rejecting the small fraction as 10 to 8. The thickness of metal will therefore be one tenth of the diameter in this case. In measuring the height of the cylinder, I include one of the rounded rims only, which is making the cylinder a

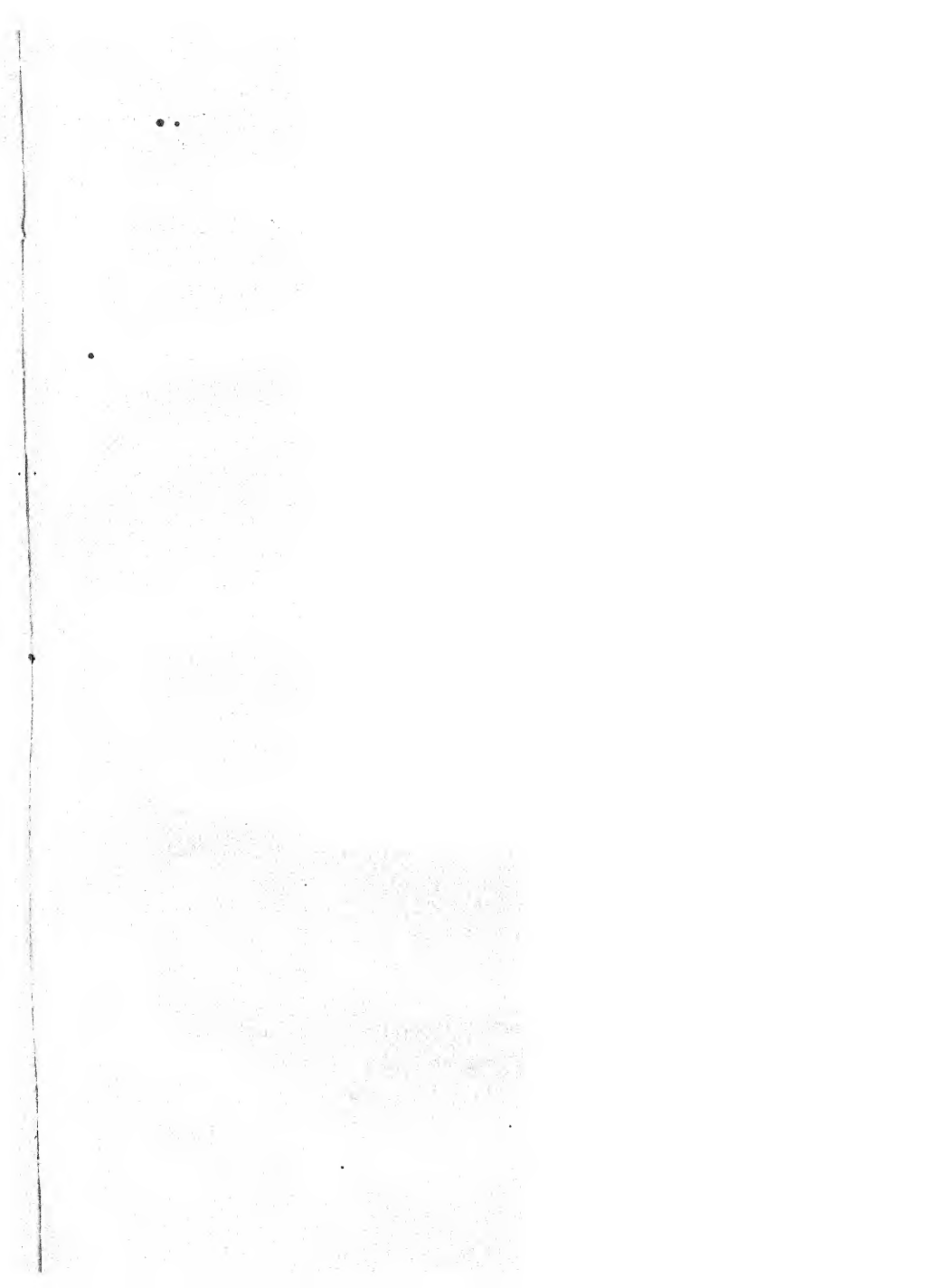
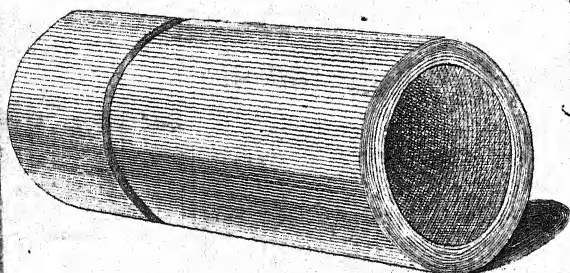
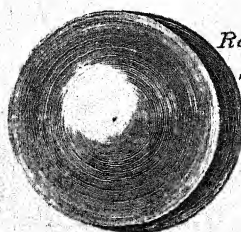
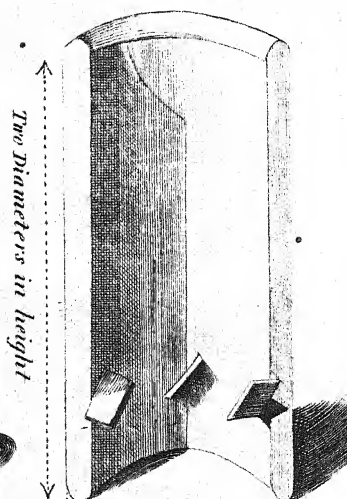


PLATE. 3

View of the Shot
and Wooden
Wad



Section showing the
rifler wings

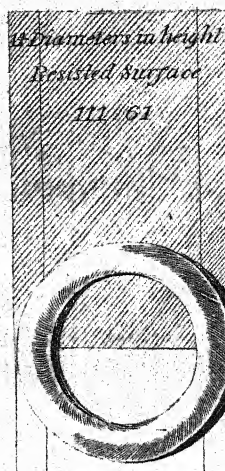


Resisted
Surface of
the Sphere
314.16



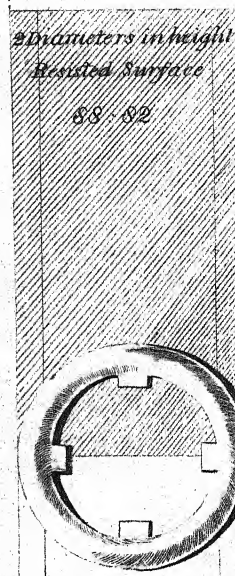
1 Diameter in height
Surface of Resistance
157.89

2 • 6 • 2



1 Diameter in height
Resisted Surface
111.61

1.5 7.4 1.5



2 Diameter in height
Resisted Surface
88.82

1 8 1

little longer than the exact computations would determine it to be, taking both the rounded edges into consideration. For a comparison, I compute the rounded rim, as if its section were semicircular, though I propose a different curve, by way of diminishing still more the resistance of the air. But the calculation will be sufficiently accurate, if the curved surfaces of both the upper and lower rims be considered, as the curved surface of a narrow cylinder, of which the length, is the mean circumference of the shot, (that is, calculated from the outer and inner circumferences,) and whose base is a circle, described upon the thickness of metal as diameter.

Comparing the surface of a common shot of equal diameter, with the surfaces of open cylindrical shot which meet resistance from the air, I find them to be as follows: An open cylinder of one diameter in height, meets with only about half the resistance opposed to a sphere of equal weight and diameter. A cylinder of one and a half diameter in height, meets with not a great deal more than one third of the resistance to the sphere; and a cylinder of two diameters in height, meets with much less than one third of that resistance, the proportions of the surfaces being as 1 to 353, that is, the sphere has more than three and a half times the surface opposed to the air, than the open cylinder of two diameters has.* By way of making ample deduction for the surface of the wings, and for friction, I will state the proportion as 1 to 3 only, and endeavour to make some kind of calculation of the effects upon the range, that this differ-

* See the accompanying plate &c. for the exact proportions of these different surfaces.

diameter ence of surfaces will occasion. That is, supposing a shot to meet only one third of the resistance from the atmosphere, that another shot of equal \times and initial velocity has to encounter, it is required to determine what advantage, in point of range, the former may be expected to possess?

Nothing but experiment can determine this question to the satisfaction of philosophers; but the first thing to be shown is, that experiments may be worth making, and I shall therefore endeavour to form a rational conjecture upon the following principles:—

The ranges of shot in general, are calculated from what is called, their terminal velocities; that is, the utmost velocities they can acquire in descending freely by their own weight on the atmosphere. In vacuo, all balls, of every size, and whatever their specific gravity, would descend, it is believed, with equal velocity; but the resistance of the air makes an immense difference, in point of fact, in shot of different diameters: the larger balls descending with greater velocities than the smaller, because their weights increase in a greater ratio than their surfaces, that is, than the resistances. Hence, a 42 lb. shot descends with nearly double the velocity of a 1 lb. shot, after they have both attained their terminal or utmost velocities; that of the former being 456 feet per second; whereas the latter, cannot acquire a velocity greater than 244 feet per second, in descending through the air by its own weight. The terminal velocities are determined by the specific gravities of the shot. When by experiment it appears, that the resistance to a given shot from the air becomes equal to its own weight, the velocity with which the shot moved to occasion that

resistance, is considered its terminal velocity, and Dr. Hutton has made calculations, founded on experiment, of the terminal velocities of shot of all sizes, supposing them to be of cast iron.

But in this case the surface (or which is the same thing, the resistance,) is only one third, whilst the weight remains the same. Let us calculate then, the proportions of two spherical shot, one of which has only one third of the surface of the other. Their diameters, will be as the square roots of their surfaces, or as 1 to 3, and their masses will be as the cubes of their diameters, or as 1 to 5.196. For example, a 1lb. spherical-ball would meet as great a resistance from the air, as a cylindrical open shot, weighing 5lb. and hence, if we calculate the terminal velocity of a 1lb. shot, supposing it to have five times its proper weight, we may deduce therefrom the range of a 5lb. cylindrical shot, discharged with equal velocity. Referring to one of Dr. Hutton's tables (*Article gunnery*, in his 3d vol. of *Mathematics*) I find, that the terminal velocity for such a weight would be, 527 feet per second; and a calculation of the greatest range of shot, possessing this terminal velocity, and discharged with an initial velocity of 1,600 feet per second, gives 3,088 yards, or 1 mile and 1,328 yards.

A similar calculation of the greatest range of a 6lb. shot, discharged with equal velocity, gives 2,089 yards, nearly 1000 yards less; that is, the range of a cylindrical 5lb. shot should be, upon these principles, about half as much again as the range of a somewhat larger spherical shot; and adverting to the rifle properties of the cylindrical shot, we may calculate upon its ranging

nearly true to its line, the whole of that enormous distance ; whereas the common 6 lb. shot, could not be depended upon at all beyond 1000 yards.

With regard to experiments, in the first instance, wooden shot, fired with small charges, would serve to show what may be expected. If there is the superiority I imagine, it will appear in the range of an open wooden cylinder, compared to that of a wooden round shot, as distinctly as if they were of cast iron, and at far less expense. Perhaps experiments with wooden shot, might be even more convincing to the judgment, since the whole ranges would be so much smaller, and better within distinct view. Robins, when he thought he had discovered the true cause of the superiority possessed by rifle-shot, put his ideas to the test of an experiment with wooden balls, and the result confirmed the truth of his reasoning.

Next to wood, perhaps, the cheapest method of making experiments with this kind of shot would be to use sheet copper. Several folds soldered together would form the cylinders very accurately, and the copper would sell again at a small loss. Or several folds of tin, or thin sheet iron, might readily be made into cylindrical shot.

I will not venture to lengthen this paper by any mention of minor matters at present which belong to the subject ; and I have omitted to say a great deal which deserves consideration, concerning the effects of the large wooden wad, so essential to my proposed shot. Its additional weight upon the usual charge of powder, should properly have been taken into calculation. As to an objection which may arise from the greater effects

of wind upon so long a shot as is now proposed, it may be disposed of in a few words. A great distinction should be made between deflections which follow from known causes, and those irregular deflections, which obey no laws whatever. The former, such as those arising from the operation of gravity, and, it may be added, from the action of side winds upon projectiles, may be, and are, allowed for. The latter, no skill or experience can combat. They are principally attributed to the whirling motion acquired by spherical projectiles, which, when the axis is not in the line of direction, has a tendency to carry them out of that line, and the axis of a round shot can never be expected to point in the line of direction except upon the rifle principle. But as for the wind, it being a force which the judgment can appreciate, as in archery, we may safely leave it to the Robin Hoods and Huberts of Artillery, who would soon learn to make due allowance for its effects.

Were I not an Englishman, perhaps, under the sober belief of the importance of my proposed projectile, I might hesitate to publish its principles to the Military world at large; but as such, I do it without any patriotic fears of evil consequences. If there be any reality and substance in the improvement suggested, I rest assured, that the most enlightened nation will adopt it first, and employ it with its greatest effect, and to the best ends. England, therefore, must always benefit most by all improvements in the art of war, let other nations adopt them as they please; and I entirely agree with the inventor of the spiral headed shot, in that same 8th Article of your first number, "that increase of power is, on the whole, in favour of rectitude and virtue:" at least,

I have no doubt it is so, with regard to the Military power of England. The more terrible She becomes in arms, the more peace we shall enjoy in the world. As to the question of additional expense, it is a matter of small consequence. Where the advantage of an innovation is decisive, it must be adopted on both sides, since no economy in weapons, can compensate for the loss of a battle. It is reasonable to think, besides, that the more expensive war necessarily becomes, the less it will be practised; and it cannot at all events be doubted, that if bows and arrows would enable an army to keep the field in modern times, without more expensive implements of destruction, we should have much more fighting in the world than we have at present.

I am, Sir,
Your's most Obediently,
ARCHIMEDES.

ARTICLE VIII.

Account of the bridge of boats on the river Tigris, at Bagdad, with a communication to the Editor, by L. E.

To The Editor of the Military Repository.

SIR,

THE following account of a bridge of boats on the Tigris at Bagdad, may prove interesting to some of the readers of your miscellany. I regret that it goes forth anonymously, and that I am unable to give it the authority of the author's name. It was copied by me a considerable time ago, in much hurry, and I unfortunately made no note in my memorandum, of the work from which I extracted it. The account is so full, so clear, and, (as I have been assured by a distinguished traveller in Persia) so correct, that little remains for me to add to it, except that besides the bridge here described, there are two similar ones over the Tigris, at Masul, and Jezum-ool-Oomar, and two over the Euphrates, at Hil, and Hillah. The establishment of boat bridges in Persia, is of very great antiquity; and the art of Pontoning, as well as of mining, both of which are now carried to such perfection in Europe, may reasonably be said to have originated in the East. It must be familiar to your readers, that the ten thousand Greeks in their advance with Cyrus, crossed the Tigris by a bridge of 37 boats. The great historian of that expedition gives

no account of the manner in which the bridge was constructed; but the boats then in use, are described by Herodotus, as made of wicker, and circular: their shape alone has been altered, they are now oblong or elliptical, flat bottomed, and plastered with bitumen, (called naft) in which production that country abounds: *b* some of the boats also are anchored, and these are the only points which appear to have been omitted in the description. *d* The breadth of the Tigris at Bagdad is 350 yards, and the current runs at the rate of 7 miles an hour. The Euphrates at Hillah (or Babylon) is 150 yards broad, and at Hill about the same.

I am not sufficiently acquainted with the localities, to be able to say how far such a bridge would be applicable to the Ganges, and other rivers in Bengal. The expense, if it were found to answer, would be trifling, and hides of leather commonly used by the Natives to cover their wicker circular boats, might be introduced as a substitute for the naphtha of Persia. The construction of bridges of this kind, with their application to military purposes, and the passage of rivers, though one of the most important branches of the science of war, appears to have been very little considered in India. The perfection to which it has been brought in the English service, by means of the establishment at Chatham, under Lieutenant Colonel Pasley of the Royal Engineers, is well known; and as the deficiency of means in the Personnel, which has hitherto crippled the Engineer departments of the Indian army, has been obviated in Bengal by the corps of Sappers and miners lately raised there, the organization of a regular system for the passage of rivers, will doubtless soon be effected,

and these advantages will then, I trust, be extended to the sister Presidencies. In the mean time, I propose, if such a communication will be acceptable, to offer you at some future time, a few remarks on military bridges, and on the system of Pontoning best adapted to India; in hopes that, however deficient my own ideas may be, the discussion will be of use in turning the attention of others better qualified than myself, to what all must allow to be an important subject.

I am Sir,

Your Obedient Servant.

Madras, 15th May 1822.

L. E.

*Account of the Bridge of boats on the river Tigris
at Bagdad.*

"Bagdad is seated on both banks of the River Tigris, in latitude $32^{\circ} 20'$ north, and longitude $43^{\circ} 51'$ east; the communication is by a bridge of boats from the one side, which is in Mesopotamia, to the other situated in Persia."

"From the banks of the river on each side, and directly opposite to each other, are built two immense walls, which project from the banks into the river; they are sixty-six feet in length, by twenty-eight in breadth. These walls serve as jetty heads, and are built of excellent and well burnt brick, so high as not to be overflowed when the water is at the highest."

"The bridge consists of 35 boats, all of the same construction and dimensions: the bows being sharp like the London wherries; the stern likewise bearing a near resemblance. Their length is 34 feet 6 inches, and their breadth 14 feet 8 inches. The distance from the jetty

heads to the first boats on each side, is 8 feet 6 inches; the space between each boat is 6 feet 4 inches, which makes the river Tigris at Bagdad to be, from bank to bank, 871 feet 4 inches. From one side of the river to the other, two massy iron chains are extended: the iron bars, with which the links are made, are as large as a man's wrist. The ends of these chains are fastened to the rings of two extremely large anchors which are buried in the earth: two within the wall of the great mosque on the Persian side; the other two within the wall of a warehouse on the opposite side: each of those chains passes over the bows of 29 of the boats, and are kept in their proper places by one of the links being placed over an iron bolt, which stands erect on the bow of each boat. Over these 29 boats a stage is laid, made of strong planks gravelled over, with railing on each side, nearly 4 feet high; the space between each railing is near 24 feet, which gives the breadth of the bridge. The other six boats, of which the bridge is formed, are contrived so as to be moved when rafts or vessels pass down the river. From the jetty heads a stage is laid to the first boat, which reaches across that boat; from this boat, another is laid over the second and third boats, which reaches and is fastened to the stage on the fourth boat, as the stage over the first boat is fastened to that over the second on each side. When boats or large vessels want to pass, it is sufficient to loosen the first boat on that side where the vessels choose to pass; the boat with the stage on, immediately swings of itself with the current, and is soon replaced; but when large rafts pass, the next two boats, with the stages on them, must likewise be let loose, which causes an impediment to the passage

over the bridge for at least half an hour. The bottoms of the boats are quite flat, drawing 6 inches water at the bow, and 4 at the stern."

"There are always boats ready to supply the place of any of those which form the bridge when they leak, or want any kind of repair. They are placed in less than 10 minutes without moving either railings, planks, or even the gravel on the bridge. It is effected in the following manner:"

"The defective boat is loaded with stones sufficient to sink her so low as to prevent her from bearing any part of the bridge; at the same time the bolts in the bows which are let into a link of each chain, are likewise loosened. The boat thus liberated, is moved in a minute, and the new boat (being previously loaded as the other was,) is hauled up in her place: the unloading is by means of many hands quickly taken out, until she bears a proportion of the bridge, when the iron bolts are introduced into the links of the chain. I have seen three boats shifted in this manner, each of them in less than ten minutes, which is mostly spent in loading the one, so as to liberate it, and in unloading the other, so as to exactly supply its place."

"The current of water causes the bridge to have a great curve. The two chains on either side from the first boats, over which they are placed, and from thence to the walls of the buildings which they pass through, are only visible for about 20 feet from each of the boats, and for the same distance from the banks of the river; the remainder, owing to their great weight and length without support, being under water. As all vessels, of every size, on this river are flat bottomed, they pass over the chains without the least obstruction."

"The water in the river is 8 months increasing, and only 4 decreasing.* The depth of the water from the 7th to the 14th June, when at highest, was 46 feet 4 inches; and from the 30th September to the 16th of October, it was, at the lowest, 14 feet 6 inches deep. The current when greatest was at the rate of 7 miles, and when least $1\frac{1}{2}$ miles per hour."

"When the water in the river is at the highest, the boats nearest the land are somewhat higher than the jetty heads; consequently, there is an ascent in passing from them to the stages over the boats, in proportion as the water rises; and a consequent descent, when the water falls: therefore, when the water has fallen so that the gunwales of the nearest boats are about 4 feet lower than the top of the jetty heads, the stages are then loosened from the jetties, and are hauled up higher, that is, to the westward; the 3 first boats and stages are higher in proportion; the end of the two first stages, which were before fastened to the jetty heads, are now laid down on the bank of the river, and fastened to an anchor on each side, which are placed about 40 feet to the westward of each jetty. These stages remain in this state till the water in the river rises again so as to bring the stage within 4 feet from the top of the jetty heads, at which time the stages are again moved, and fastened to the jetty heads."

*The melting of the snow in Armenia, occasions the floods of the Tigris in the spring; while the rains in the beginning of winter, create a gentle rise in November and December. The greatest rise is in April and May. L. E.

• • • We return our best thanks to the writer of the above truly interesting communication, and shall most willingly and gratefully publish any thing further which he may favor us with, upon the important subjects of Pontoning, and the passage of rivers.

Col. Pearse, as will appear in future Nos. of this work, was extremely anxious to establish a regular Ponton establishment in Bengal, in his time; and it is really astonishing, that so important a one has been so long neglected. We may now however anticipate the approaches of an European foe, when all the energies of the British Government in India, and of the armies which have so long maintained our power triumphant in the East, will be necessarily called forth.

If Russia decides upon invading Hindoostan, through Persia, our policy will undoubtedly be to keep the seat of war as far distant as possible from our immediate possessions; and our armies, to meet the enemy with effect, must enter those of our neighbours well equipped, and independant of foreign supplies. EDITOR.

ARTICLE IX.

Method of sawing Cast Iron, By M. Dufand, director of the Iron Works at Moutalaire, near Creil, communicated in a letter to M. D'Arcet. Also an account of an experiment of this nature in the model department at Dum Dum. The first detail is extracted from the Repertory of Arts, Manufactures, and Agriculture &c. VOL. XXII, second series, 1813.

I HAVE undertaken, with the greatest pleasure, the experiments on sawing hot cast iron, that you recommended to me. I have followed your instructions; my trials have been attended with the most complete success, and I hasten to give you an account of them. These experiments were the more interesting to me, as I have since applied them to practical purposes.

My first trial was made with the support of a grate, 108 Mil. (4.25 in.) thick. This piece of cast iron was heated in a forge fire with coal; and as soon as it had acquired a sufficient degree of incandescence (this is the French term) it was placed on an anvil, and I sawed it with a common carpenter's saw, without any difficulty, and without any injury to the saw, which I dipped immediately into cold water. The carpenter continued to work with the same saw, without having any occasion to repair it.

In this my first trial a little accident occurred. The end of the iron I was sawing off not being supported, it

broke when 20 or 25 m. (about a line) remained to be cut through; but this slight defect I immediately removed with the saw. Convinced of the ease with which a common saw would cut hot cast iron, I afterwards applied it to the demands of the iron-works.

I had occasion to shorten a pivot of 135 m. (5.3 in.) diameter; but afraid of its breaking if I cut it cold, an operation besides very tedious and uncertain, unless executed in a lathe, I had resolved to cast another, when the experiment I have just mentioned determined me to saw it. Having marked the place of section with red lead, I placed the pivot in a reverberatory furnace; and when I thought it sufficiently hot, I had it taken out of the furnace, and placed on an iron support, so that the two ends had equal bearings. In four minutes, with two saws, which I used and cooled alternately, the piece was cut off, to the great astonishment of my workmen, who found the saws unhurt.

The same day I performed a still more difficult operation. I had an anvil, which I was about to cast afresh, because it was 41 m. (1.6 in.) too thick, so that it could not be placed in its bed.

I marked the place of the saw-kerf with red lead. The two cuts to be made, were 217 m. (8.5 in.) long, by 189 m. (7.4 in.) high; and the thinness of the piece to be cut off required precision. This anvil was heated in a reverberatory furnace, in the same manner as the pivot; and when sufficiently hot, two workmen took hold of it with a strong pair of tongs, and laid it on a back of cast iron. It was cut with much ease and precision, by the same saws that had been used in the preceding instance.

In the course of these experiments I remarked,

1st. That hot cast iron may be sawed as easily, and in the same space of time, as dry wood.—

2nd. That, to diminish the resistance, the saw should be set fine.—

3rd. That iron heated in a furnace, saws more easily than if heated in a forge : and the reason is simple ; in a furnace it is heated equally throughout, while in a forge the part near the towel is almost in a state of fusion, while that opposite to it is scarcely red hot.—

4th. That the iron must not be made too hot ; for if its surface be too near a state of fusion, the saw will be clogged, and the process will not go on well.—

5th. That the saw should be moved very quickly, because then it will be less heated, make its way better, and the cut will be more clean and exact.—

Lastly, that the iron should be so placed as to have a firm bearing every where, except where the saw is to pass ; otherwise it is liable to break before the cutting is finished.

These, Sir, are the whole of my experiments and observations ; and I shall be well pleased if they answer your views.

It is the more to be wished, that this method of cutting cast iron, should be rendered as public as possible, as it may be happily applied in many arts. I thank you much for having suggested it to me, for I shall find frequent occasions for it.

Note by Mr. D'Arcet.

Several years ago Mr. Pictet observed a workman saw a cast iron pipe in the workshop of Mr. Paul, of

Geneva. He had lately occasion to mention this to Thenard, who afterwards communicated it to M. Mollard. M. Mollard, struck with the uses to which it might be applied, tried it, at the Conservatory of Arts and Trades, on pieces of cast iron 7 cent (2.75 in) square, and on plates of different thickness.

Mr. Mollard used a common saw, and succeeded perfectly with these various pieces, without injuring its teeth. He observed, that the iron should be heated only to a cherry red; and that it should be cut briskly, using the whole length of the saw. M. Mollard afterwards found, that this process was known to a workman of M. Voyerne, who practised it in fitting the cast iron plates used for making stoves. It is probable that this simple operation may be known in other workshops; but it is lost as it were, since eminent persons in the arts are generally ignorant of it.

We see that the experiments mentioned in M. Dufand's letter, confirm the account of M. Pictet, and the trials of M. Mollard: of course there remains no doubt of the possibility of cutting cast iron when hot, or of the utility of the process.

We conceive it would be practicable to employ it in the fabrication of iron cannons, for cutting off the cap of the piece, and even for removing the square piece left at the extremity of the button, which serves for mounting it on the boring machine. Perhaps advantage might be taken of the red heat, which the cannon retains long after it is cast, for sawing off the cap in the mould itself, its upper part only being removed.

The same process would certainly furnish an easy and ready method of cutting a cannon to pieces, and thus

rendering it unserviceable ; or facilitate its melting in the reverberatory furnace, when required to be cast afresh. Perhaps it might be employed also to ascertain the different ranges of a piece of cannon, shortened by little and little. The knowledge of a practice applicable to so many purposes of the arts, cannot be too generally made known.

Experiment in the Model Department, Dum Dum.

The above experiments establishing a fact, the knowledge of which is of considerable importance in all Arsenals and Ordnance Establishments ; a further trial, of the practicability of cutting hot cast iron was made at Dum Dum, in the Model Establishment, on the 17th of April last.

An hollow cast iron cylinder, 6 inches and $\frac{3}{8}$ exterior diameter, and $\frac{1\frac{1}{16}}$ ths of an inch in thicknes of metal, was heated to a moderate red heat, in a Smith's forge ; and was then cut through with a hand saw, with about as much labour as would have been required in cutting through a piece of *lignumvitæ*, or similar hard wood, of the above dimensions.

The iron as it cooled, was successively re-heated in the forge, and the saw was every now and then dipped in the water trough. The saw used, was an old worn-out and defective carpenter's hand saw ; the blade, (originally a very flimsy one,) was cracked across, near the handle, to the extent of $1\frac{1}{2}$ inches ; nevertheless, with this defective instrument, the operation was performed with ease, a small hand vice being attached to the end of the blade, to serve for an additional handle to apply two workmen to the saw, so as to enable them to draw in opposite directions. The teeth of the saw were twice slightly sharpened with a file during the work.

S. P.

ARTICLE X.

Colonel Sir Howard Douglas's Treatise on Naval Gunnery.

THIS truly valuable, and patriotic production, has lately found its way to India.

The work is entitled, "A Treatise on Naval Gunnery"; strictly speaking it is so; but there are so many valuable remarks, and so many useful memorandums, combined with the dispassionate discussion of some of the most important topics, connected with the use of the great arm of Artillery both by sea and land, that every Artillerist, who feels an interest in his profession, will peruse the pages of Sir Howard with pleasure, and doubtless with the permanent satisfaction of improvement.

In the several writings with which this author has favored the public, the subjects he treats upon are neither new, nor unknown; but it is singular that he has the peculiar merit, (in resuscitating important enquiries) of treating his subjects in so clear and engaging a manner, and dressing them up and illustrating them in such vivid and striking colours, that they have all the air of interesting novelties—at least, such is the impression we have received from his labors.

But what in our idea constitutes the chief value of Sir Howard's writings, arises from the vast importance there is to be attached to the reformation of the abuses,

and the correction of the errors which he has so clearly exposed, and for which he has so ably proposed remedies.

Let us hope, that the statements which Sir Howard has advanced in his pages, will not fail to rouse us from a disgusting apathy, and conquer the most inveterate obstinacy of custom, which is but "the idol of fools," and that his labors may lead to the adoption of a system in Naval Artillery, founded upon scientific principles; while the land Artillerist may gratefully acknowledge the acquirement of much valuable professional knowledge from the perusal of them.

There must have been some ruling, yet to us inexplicable cause, which has prevented British Artillery officers, (generally speaking,) from appearing before the public with the results of their experience, and their own professional discoveries and improvements, through the medium of the press; while many a charlatan Frenchman, amidst others of his country-men of undoubted merit, has filled quartos in honor, if not in advancement of his profession.—

Happily for present and future Artillerists, the productions of Muller, Robins, and the great philosopher Dr. Hutton, are standard works which will descend to posterity, and be held in just value as long as Artillery remains a science: but the British Artillery officer, until of very late years, has been unknown as an author. The cause cannot be owing to the want of science or ability amongst the members of the Royal Artillery, and there is no better evidence of this, perhaps, than that the *British Artillery is now undeniably the first in the world*; and must have been made so by the exertions of the several members of that distinguished

corps. We are induced to dwell a moment upon this point, from the circumstance that Sir Howard Douglas himself appears, from his introduction to the present Treatise, to consider the press as an objectionable medium for cultivating improvements in warlike practice; and feels it necessary to enter into an explanation of the circumstances which led to the publication of it; and records the permission obtained from the Lords Commissioners of the Admiralty for printing the work, in the very title page. There may be something of national policy in this, but we really cannot see any reasonable ground for it.

For surely in these days it cannot be a question, whether the advantages of publishing a work of this description be more than counter-balanced by the danger and evils (principally imaginary) which may follow. If a manuscript contains information that is generally valuable to our brethren in arms, should we withhold it from them, because the enemies of our country may share in the information, and thus suffer it, however important, to moulder amongst the dusty records of official inanity, by restraining the publication?

Rather let us endeavour to keep ourselves the strongest of the strong—let there be no weakness to discover; and then the enemy cannot harm us by having a full view of our strength. Supposing a work published, Sir Howard's for instance, it cannot be denied that it contains much valuable information, at the same time that it exposes errors and abuses in our system which require correction, and which must doubtless, ere long, be corrected: the reasonable chance is, that our enemies, whoever they may be, will not benefit so much by the work as ourselves.

But to proceed:—The work before us is divided into five parts, exclusive of an appendix consisting of useful Tables &c. &c.

PART I.

“On the Organization and Training of Naval Gunners.” Page. 1.

PART II.

“On the Theory and Practice of Gunnery, showing all the established Principles of the Science, applied more particularly to the Service of Naval Ordnance.” 31.

PART III.

“On the Manual of Naval Gunnery.” 143.

PART IV.

“On the Equipment, Practice, and Service of Naval Ordnance.” 194.

PART V.

“Observations on some recent Naval Operations, and on the Tactics of Single Actions.” 258.

APPENDIX. 287.

From the above Table of contents, the reader will be able to find under which head each of the following extracts is given in the original.

These selections have been made by a friend who was forcibly struck with them as useful memorandums; and we shall now most gladly avail ourselves of his labors which he has so kindly offered, together with some original remarks of his own.—

EXTRACTS.

(Page 43) "In practice it also appears that the greatest range is not produced by an elevation of 45° , as in the parabolic theory; but that, according to the weight and velocity of the projectile, the amplitude may be increased by lessening the elevation, even as low as 30° : small velocities and large shells ranging farthest at an elevation of nearly 45° , whilst 30° produces the greatest range with small shells projected with great velocities. In the first case the resistance is comparatively trifling—in the latter it is such as is exhibited in the following table:"

Table of the Motions of a 24 pound shot, projected at 45° Elevation.

Velocity per second.	Range in vacuo, or according to the Parabolic Theory.	Actual. Range.
Feet.	Yards.	Yards.
200	415	320
400	1658	1000
600	3731	1391
800	6632	1687
1000	10362	1840
1200	14922	1934
1400	20310	2078
1600	26528	2206
1800	33574	2326
2000	41450	2438
2200	50155	2542
2400	59638	2640
2600	70050	2734
2800	81241	2827
3000	93262	2915
3200	106111	2995

(Page 45) "To explain the nature of resistance to the flight of shot and shells it must be remarked, that in the motion of a ball through the air, no particle of that fluid can be disturbed without moving at the same time a great many others; and not in any one direction, but according to that of their contact with those from which the impulse is received. As the moving body passes on, there is left behind it a kind of vacuum, more or less complete, according to the degree of velocity. When the ball moves quicker than the air can rush into the space left behind, the vacuum becomes complete. Now there is a certain limit to the velocity with which air can rush into a vacuum, viz. about 13, or 1400 feet in a second,* and consequently when the velocity of the ball exceeds this, it is manifest that the resistance must be much increased; for there being then no pressure of the fluid behind the ball, it will have to support the whole weight of a column of the air on its fore part, as well as to give motion to the particles which it strikes; and the air which is before it, will be in a very condensed state."

Dr. Hutton draws the following inferences from experiments he made with Mr. Robins' whirling machine.

(Page 50) 1st "That the resistance is nearly as the surface; increasing but a very little above that proportion on the the larger surfaces."

2dly. "The resistance to the same surface, with different velocities in slow motions, is nearly as the square of the velocity but gradually augmenting as the velocity increases."

3dly. "The round and sharp ends of solids suffer less resistance than flat or plane ends of the same diameter."

* 1366. When the barometer stands at thirty inches. See Hutton's Tracts, Vol. III, p. 195.

4thly. "When the hinder parts of bodies are of different forms, the resistances are different, though the fore-parts should be exactly alike and equal, owing to the different pressures of the air closing on the after-parts."

CASE III.

To determine the Velocities of Shot of the same Diameter, but of different Weights, or Densities, the Charges being constant.

(Page 57) "The experiments under this head showed that the velocities communicated by constant charges, to shot of the same diameter but of different weights, are, inversely, as the square roots of the weights."


Observations "To gain an increase of range or penetration, or to augment the force of the blow with which shot strike balls made of heavier matter may be used with advantage. A shell, filled with lead, will produce a greater blow than an iron shot of the same diameter, discharged with the same quantity of powder; for, as will be shown presently, the momenta, or force of the blows, are directly in the ratio of the square roots of the weights of shot."*

"The former may also be made to range further than the iron ball, from being better able to overcome the resistance of the air; and consequently retaining longer the superior velocity communicated by a greater charge of powder. From this an increase of accuracy also results, because the same range may be produced with

* At the siege of Cadiz the French used shells filled with lead, which, discharged with a velocity of about 2000 feet per second from Howitzers, (one of which is now placed as a military trophy in St. James's Park,) ranged to the astonishing distance of three miles.

less elevation; and accuracy is gained as elevation is reduced."——

"This principle also shows, as suggested [by Dr. Hutton, that oblong shot may be used occasionally, with advantage, either against ships, or in breaching batteries by land. The great uncertainty of such shot, however, from irregularities in their flight, would not, at any great distance, be compensated by the advantages contemplated."

"The windage of oblong-shot, should not be greater than .14 of an inch, (the windage of a cannonade,) so that, in fact, a 12-pounder gun discharging a solid of iron of 24 lb. weight, (which its oblong shot might be,) with a charge of 4 lb. would be capable of producing as great an effect as a 24-pounder cannonade; and if the oblong-shot were to strike with its larger dimensions, the effect would be much greater. Oblong-shot should be cylindrical, with hemispherical ends. For a 12-pounder a shot of this shape, exactly equal to the weight of two  12-pounder balls, should be 2.935 inches long in the cylindrical part, and the total length 7.338 inches. In close action, the chance of hitting with both balls is so great, that 2 roundshot should be preferred to this expedient."

"The proposition for using oblongshot is not new. Some very extensive experiments were made at Landguard Fort, in 1776, to ascertain the comparative ranges, and accuracy of long and round shot, with 42, 24, 18, and 12-pounders."

In breaching mud Forts, where the Battery is within proper distance, shot of the above

description would doubtless be found useful: penetration not being for the most part the object, as in demolishing a fabrick of masonry. The size and weight of an 18-pounder oblong shot, would produce great effect in clearing rubbish or soil from the top of an imperfect breach, either in a fabrick of masonry after it has been shaken by roundshot, or in a mud rampart having a considerable slope from the beginning; in this last, the process of battering should be downwards, commencing at the top. By this contrivance also, on occasions where 18-pounders cannot be conveniently transported, 12 pounders might be converted into tolerable breaching guns; or the number of guns in the battery increased &c.

CASE IV.

(Page 69) *To determine the Velocities of Balls with different degrees of Windage.*

The following Table shows the Windage of Guns and Cannonades in decimals of—an inch.

Natures.	Pr.	Pr.	Pr.	Pr.	Pr.	Pr.	Pr.	Pr.	Pr.	Pr.	Pr.	Pr.
	68	42	32	24	18	12	9	6	4	3	2	1
Guns.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
	—	.33	.30	.27	.25	.22	.20	.17	.15	.14	.12	.09
Canonades.	.15	.15	.15	.14	.12	.12						

“ From experiments made on this important question it appeared that very great differences in the velocities of balls, arise from very small differences in the windage.—

That with the degree of windage established in our service, no less than between $\frac{1}{3}$ and $\frac{1}{4}$ of the force of the powder escapes and is lost; and that as balls are often less than the regulated size, it frequently happens, that half the force of the powder is lost by unnecessary windage!"

(Page 70.) "The prejudicial effect which the present windage has upon accuracy, arises from the reflections of the ball in passing along the bore. These will manifestly be greater in proportion as the difference between the diameter of the shot and the calibre of the gun increases. From these reflections, shot acquire a sort of zig-zag motion, and do not generally quit the cylinder in the direction of its axis. If the last bound be upon the lower part of the bore, the angle of the shot's departure will be increased—if above, diminished: these affect the length of range.—If the last reflection be on either side of the bore, the line will be altered; and, in every case, the friction arising from these rubs, will give the ball an irregular whirling motion, productive of great inequality of resistance from the air, unless the rotation be at right angles to the direction of the projectile's flight."

Sir Howard proposes, in Page 77, to give guns from the 42-pounder to 12-pounder inclusive, .13 of windage; below the 12-pounder .1 of windage.

(Page 78.) "But whether a new scale of windage be adopted or not, it is important that shot be protected as much as possible from those vicissitudes, and from that treatment, which are continually operating to diminish their size, and consequently to increase the windage. Every possible precaution, therefore, should be used to

keep shot from rust, by painting or greasing them, and to keep them as dry as possible. When shot are cleaned, the rust should be carefully *rubbed* off, and not *beaten* off with hammers."

The justice of the above remarks must be apparent to any one who has attended a single practice season: the vicissitudes being greater in this country than in Europe, the injury sustained by shot and shells from exposure, and the *hammering mode* of cleaning afterwards, is proportionally greater. The exterior roughness of some of the shells is almost incredible: even the Gomer principle will not remedy this evil, (though it will partly the loss of size,) as the fluid escapes through innumerable crevices, even when the shell is close down in the cone. Experiments made lately at Dum Dum with equal charges, gave one seventh shorter ranges with the Gomer, than with the common chambered mortar, at a distance of 700 yards.

(Page 80) "After repeated trials with a 6-pounder, a 9-pounder, and a 12-pounder, at 300, 600, and 1200 yards, it was proved, "that with charges of powder $\frac{1}{6}$ less than usual, the larger shot, and smaller windage, produced rather the longest range."

"Recourse was also had to the ballistic pendulum, to discover the proportional excess of momentum of the larger balls over the smaller: and the result, after a very satisfactory course of experiments, assisted by the scientific research and well-known mathematical abilities of Dr. Gregory of the Royal Military Academy, cor-

roborated the trials by ranges, leaving no doubt of their accuracy." In consequence of these trials, the Committee* fixed the quantity of windage for field guns, at one tenth of an inch; the same which I had suggested."

"Now it is clear that this improvement may either be applied to save one sixth part of the quantity of powder provided for field service, without diminishing the power of range; and consequently, to economize without detriment, the means of transport for ammunition; or the alteration may be applied to produce longer ranges, if this be preferred to the economical consideration."

"This preference has, very properly, been given; and the established charges adhered to accordingly."

"A great collateral advantage has followed from this correction of windage. It was at first apprehended that the increased effects, arising from the additional weight of shot, and diminished windage, would injure brass guns; but it is quite the reverse."

"With the reduced quantum of windage, guns are much less injured, and will last much longer than formerly; and this has been so well ascertained, that in consequence of this correction, it is now proposed to abandon the wooden bottoms, to which shot were fixed for the purpose of saving the cylinder; substituting for them the paper cap taken off the end of the cartridge."†

* Select Committee of Artillery officers at Woolwich.

† Every cartridge in the British Royal Artillery is covered with a paper cylinder, closed at one end. This protects the serge or flannel from being rubbed, preserves the powder from damp, and retains all dust which might otherwise escape to the danger of the ammunition.

"This being put over the ball, is quite sufficient to keep it from rolling or shifting; whilst by supporting or fixing it thus, the centre of the ball coincides with the axis of the cylinder, and the space for windage is reduced to a complete annulus, which admits of the percussion from the charge being equally received, and which prevents, or very much reduces, that injury, or indentation which the cylinder receives when the ball touches it on the lower part only: for when the space for windage is all above, the action of the powder is exerted in a manner to produce that effect on the bore, near the seat of the ball, which is soon discovered in brass guns."

*Extract of a letter from Sir A. Dickson.**

"The number of very high shot however, amounted to two or three thousand; and as I know they were brought forward in the latter part of the siege, it has always been to the use of these shot that I have attributed the singular correctness of the fire in making the smaller breach: for although the battery was from 500 to 600 yards distant from its object, every shot seemed to tell on the same part of the wall as the preceding one. Now this was not the case in firing with common shot at such a distance; for some struck the wall high and others low, although the pointing, as the best gunners have assured me, was carefully the same." (page 85.)

(Page 96.) "The preceding observation, introduces an important remark on the modes of *gauging shot*. With ring-gauges, shot, not perfectly spherical, may pass in

* Lieut. Colonel Sir Alexander Dickson, K. C. B. who commanded the battering train at all the sieges in the Peninsula; an elder brother of Lieut. R. C. Dickson, Bengal Artillery.

one direction, or section, but not in all; and may therefore jam in rolling into the cylinder of the gun."

"Shot gauges should therefore, be cylindrical, as in the French service; for balls which roll freely through gauge-tubes, cannot possibly jam in the cylinder of the piece if it be perfect."

(Page 101.) "It appeared that the velocities of balls, fired with equal charges, increase as the gun is longer, in a proportion which is nearly the middle ratio between the square and cube roots of the length of the bore."

"Mr. Robins says that neither the distance to which a bullet flies, nor its force at the end of its flight, are much increased by very great augmentations of the velocity with which it is impelled, and therefore, that in distant cannonades, the advantages arising from long guns and great charges, are but of little moment. Another of his maxims is, that whatever operations are to be performed by Artillery, the least charges with which the object in view can be effected, should always be preferred."

(Page 103) "Now these maxims entirely overlook the main desideratum, *accuracy of practice* :—

(Page 104) "Comparing the powers of the long 24-pounder, length $9\frac{1}{2}$ feet, with those of the short 24, length 6 feet 6, we perceive, that though the extreme ranges may be nearly the same, yet for practice at 300 yards, the long gun might be laid point-blank, whilst the latter would require nearly half a degree of elevation. At 1000 yards the former would only require an elevation of 2° , which, with the short gun, would only give a range of about 800 yards. Such niceties of elevation cannot, perhaps, be accurately observed in ship-practice :

but when guns, which do not range alike with the same actual elevation of cylinder, are opposed to each other, the chances as well as the power of accuracy are much in favour of the gun which requires least elevation, because the path of its ball coincides more with the horizontal direction.

CASE VIII.

To determine the Effects produced on the Velocity of the Ball, by varying the Weight of Gun; and by restricting or preventing the Recoil:—Charges and Shot constant.

(Page 121.) "Varying the weight of the gun produced no change in the velocity of the ball."

The guns were suspended in the same manner as the pendulous blocks, and additional weights were attached to the pieces, so as to restrain the recoil; but although the arcs of the recoil were thus shortened, yet the velocity of the ball was not altered by it. The recoil was then entirely prevented, but the initial velocity of the ball remained the same.

It has been supposed, and is still very generally maintained among practical men, that uncertainty in Artillery practice is much increased by the irregular motion of the gun in its recoil, and that by preventing this action, this error would be corrected, and the shot be projected to a greater distance. Upon this notion chiefly the non-recoil principle was founded, and much maintained in our naval service. Now the recoil of an 18-pounder, charge 8lb. corresponding to the time in which its shot is passing along the bore, is only .2218, or less than one fourth of an inch. This is calculated upon the following principle:—Gunpowder, when fired,

endeavours to expand with equal force in every direction, and consequently acts equally upon the bottom of the bore, and upon the ball in its passage along the cylinder, supposing no loss of force by windage, that is, the ball to fit tight. The velocity of the gun in its recoil, and that of the ball, are therefore inversely as their weights, a sufficient allowance being made for friction. The weights moved in the two directions, (*viz*: the shot along the bore, and the corresponding recoil of the gun) being known, and the time and moving force being the same, the spaces are inversely as the quantities of matter moved. The space which the shot passes over is the length of the bore, (reckoned from the space where the shot lies) minus the space which the gun recoils in that time; the quantities of matter are also known: hence the corresponding recoil, the unknown quantity is found, from an equation formed from the above proportion, to be $\cdot 2218$ or $\frac{2}{9}$ of an inch. It is scarcely possible to prevent the recoil, corresponding to the time of the shot passing along the bore: for it appears, that even a shake or play of about $\frac{1}{3}$ of an inch is sufficient for this with an 18-pounder, charge 8 lb. When the re-action, arising from any further recoil being prevented, *does* come, the shot is not effected by it. The degree of recoil corresponding to the flight of the shot along the bore, is sufficient however to explain the known fact, that any accident happening to the gun or carriage at the moment of firing, such as the bed or a coin breaking or flying out—a truck coming off, or a trunnion breaking, sensibly affects the length as well as the direction of the range.”

CASE IX.

The Penetration of Balls of different Natures and with various Charges, into Masses of Timber.

(Page 123.) "The results of the different experiments to ascertain the quantity of penetration, were various, arising no doubt, from inequality in the consistency of the blocks of wood, and from different degrees of elasticity; but they yield with certainty, the following conclusions, viz. 1st. That if equal balls be discharged against a mass of timber, the depths of the cavities will be nearly as the squares of the velocities."

2nd "That unequal balls, of the same matter, discharged with the same velocity, will penetrate to depths proportioned to their diameters; so that a greater ball will not only make a larger hole, but will also penetrate further than a small ball discharged with the same velocity.

CASE X.

To determine the Effects produced by different Degrees of Ramming, and by using Wads of different Degrees of Tightness.

(Page 127) "It appeared that different degrees of ramming, or different dimensions of wads, made no sensible alteration in the velocities of the ball as determined by the vibrations of the pendulum. Stout, firm, junk-wads, so tight as with difficulty to be rammed into the gun, were used; sometimes they were placed between the powder and ball, sometimes over both—but no effect was discovered in the velocity of the ball. Different degrees of ramming were also tried without wads. The charge was sometimes set home without being compressed—

sometimes rammed with different number of strokes, or pushed up with various degrees of force ; but the velocity of the ball remained the same."

"With small balls i.e. great windage, the vibrations of the pendulum were much reduced, although tight wads under the shot were used ; so that wads do not prevent the escape of the inflamed powder by the windage, nor under any circumstance occasion any sensible difference in the velocity of the ball."

The above facts are singular, but from Sir Howard's scientific correctness, there seems no room for doubt.

CASE XI.

To compare the actual Ranges and Times of Flight, with the initial Velocity obtained from the Motion of the Pendulum, in order to determine the Effect of the Resistance of Air.

"From these, experiments, the table III is formed, and the following general inferences are drawn."

1st. "That there is very little advantage obtained by any increase in the lengths of guns, beyond a certain limit; since the superior initial velocity of shot from long guns, is reduced to an equality with those from short guns, after passing over certain spaces."—

2nd "That there is no advantage in increasing the charge beyond what is necessary to produce a certain velocity ; since the increased resistance soon reduces it to an ordinary celerity."—

3dly "It was confirmed, that the velocities are nearly in the proportion of the square roots of the charges."—

4thly " That there is a gradual and regular increase of resistance, as the velocity is increased, as far as a velocity of 1400 feet per second, when the vacuum behind the ball being complete, the resistance is greatest, and is then as the $\frac{21}{9}$ power of the velocity nearly; after which the resistance gradually decreases, as the velocity increases, till it arrives at about the $\frac{21}{20}$ power; a law unknown till it was discovered by these experiments."

" The initial, or first velocity of a ball, may be determined from the following table of experimented ranges, by rules, CASE II. (Art. 33); and CASE III. (Art. 36): viz. that the velocities of different balls, with different charges of powder, are as the square-roots of the weight of powder directly, and inversely as the square-roots of the weights of the balls."

TABLE II.

Balls.		Powder.	Elevation.	Velocity. of Ball.	Range.	Time of Flight.
Weight.	Diameter.					
oz. dwt.	inches.	ounces.	degrees.	feet.	feet.	seconds.
16..5	1.96	2	15	860	4100	9
16..8	1.96	4	15	1230	5100	12
16..12	1.96	8	15	1640	6000	14½
16..12	1.95	12	15	1680	6700	15½
16..10	1.96	2	45	860	5100	21

"To determine the initial velocity of a 24 lb. ball, discharged with 8 lbs. of powder. By the table it appears that 8 oz. of powder discharged a 1lb. ball with a velocity of 1640 feet. Then as the square root of $\frac{1}{8}$ oz.: the square root of $\frac{128}{24} :: 1640$: the square root of $\frac{16}{3} = 1640$ and the square root of $\frac{2}{3} = 1339$, the velocity of the 24 lb. ball."

(Page 110) "The resistance of the air to a ball discharged with any velocity, may be determined from the following table."

TABLE III.

Resistances to a Ball of 1.965 inches Diameter, and 16 oz. 13 dwts. Weight.

<i>Velocity.</i>	<i>Resistance.</i>	<i>Velocity.</i>	<i>Resistance.</i>
feet.	lbs.	feet.	lbs.
100	.17	1100	28.56
200	.71	1200	35.28
300	1.61	1300	42.71
400	2.91	1400	50.72
500	4.65	1500	59.19
600	6.90	1600	68.93
700	9.75	1700	76.78
800	13.25	1800	85.54
900	17.52	1900	94.11
1000	22.63	2000	102.36

"Thus to determine the resistance of the air against a 24 lb. ball, discharged with a velocity of 2000 feet in a second. By the table it appears, that the ball of 1.965 inches diameter, with a velocity of 2000 feet, suffered a resistance of 102.36 lb. The resistances, to equal velocities, being as the surfaces of the balls, i. e. the squares of their diameters, we have as 3.86 (square of 1.965): 31.36 (square of 5.6 diameter of a 24 lb ball):: 102.36: 829 lb the resistance to a 24 lb ball with a velocity of 2000 feet in a second.

(Page 133) "But in computing these resistances, the decrease in the density of the air upwards, has been disregarded; whereas, projectiles are less and less resisted as they ascend, and consequently rise to greater

heights than if the medium were of uniform density. To determine the difference resulting from this, it is necessary to know the greatest velocity that any ball can acquire in descending through the air, that is, the terminal velocity with which the ball will uniformly descend when the resistance becomes equal to the urging force, that is, equal to the weight of the ball."

"To ascertain the terminal velocity of a ball weighing 1.05 lb.—It appears, first, from Table III. (Art 110,) that the resistance 1.05, and the corresponding velocity, fall between .71 and 1.61. but the resistances being nearly as the squares of the velocities, when these are not very different, and having the velocity 200 answering to the resistance, .71 we have, as $.71 : 1.05 :: 200^2 : v^2$ 59049; and the square root of 59049=243 feet, the greatest velocity a ball of the weight 1.05 lb can acquire in descending through air."

(Page 134.) "For any other weight of ball, the resistance to balls of different weights (being as the surfaces,) increase as the squares of their diameters—or one power less than the increase of weight (or urging force,) which is as their cubes. Now this resistance being as the squares of the velocities nearly, we must increase the square of 243 feet, the velocity just found, in the ratio of the diameters, to find the terminal velocity of any other ball. From this Doctor Hutton formed the following table, in which the terminal velocities corresponding to all natures of balls are given, and the heights from which they must descend, in vacuo, to acquire such celerities."^{*}

^{*}The celebrated Mr. Carnot has entirely overlooked the circumstance of *terminal velocity* in his proposition for defending besieged places by means of vertical fire. Applying the above investigation

TABLE IV.

<i>Weight of Ball.</i>	<i>Diameter of Ball.</i>	<i>Terminal Velocity.</i>	<i>Height due to terminal Velocity.</i>
lbs	inches,	feet	feet
1	1.923	247	948
2	2.423	277	1193
3	2.773	297	1371
4	3.053	311	1503
6	3.494	333	1724
9	4.000	356	1970
12	4.403	374	2174
18	5.040	400	2488
24	5.546	419	2729
32	6.106	440	3010
36	6.350	449	3134
42	6.684	461	3304

“ When the initial velocity is known, the elevation which produces the greatest range, and that range, may be found from the table V. formed by Dr. Hutton, from an approximation of Sir I. Newton’s. To use this table, divide the initial velocity by the terminal velocity, peculiar to the given ball in table IV. and with the quotient, enter the first column in table V.—the corresponding elevation will be found in the second column; and the number

of the terminal velocities of different solids to his project, I soon discovered, that he had not allowed for the prodigious effect of resistance; and in my observations upon his Work, I have endeavoured to expose the fallacy of a system erroneous in principle; and any application of which must, for other reasons also, be either enormously expensive, or extremely insecure.

“opposite, in the third column, multiplied by the altitude due to the terminal velocity (table IV) will give the range nearly.”

TABLE V.

Table of Elevation giving the greatest range.

Initial velocity divided by the terminal Velocity.	Elevation.	Range divided by the altitude due to the terminal velocity.
0.6910	44° 0'	0.4110
0.9445	43° 15'	0.6148
1.1980	42° 30'	0.8176
1.4515	41° 45'	1.0210
1.7050	41° 0'	1.2244
1.9585	40° 15'	1.4278
2.2120	39° 30'	1.6312
2.4655	38° 45'	1.8346
2.7190	38° 0'	2.0379
2.9725	37° 15'	2.2413
3.2260	36° 30'	2.4447
3.4795	35° 45'	2.6481
3.7330	35° 0'	2.8515
3.9865	34° 15'	3.0549
4.2400	33° 30'	3.2583
4.4935	32° 45'	3.4616
4.7470	32° 0'	3.6650
5.0000	31° 15'	3.8684

Example.—“To find the greatest range of a 24 lb ball, discharged with a velocity of 1640 feet in a second, and the corresponding angle of elevation to produce that range. The terminal velocity of a 24 lb ball (table IV.) is 419, and its corresponding altitude 2729. then $\frac{1649}{419}=3.91$ nearly, equal to a mean between 3.733, and 3.9865 in the first column of table V, to which corresponds the mean elevation 34°37'; then the number 3.4532, a mean between 3.0549 and 2.8515 in the third column, multiplied by

2729, the height due to the terminal velocity. Table IV, gives 9424 feet, or upwards of a mile and three quarters for the greatest range.

These examples and table V. are only adapted to the ranges of cannon balls.

TABLE VI.

Table of Dimensions, Weight, Terminal Velocity, and Altitude due to Terminal Velocities of Shells.

Diameters of mortars.	Diameter of Shells.	Weight of shells filled.	Weight of equal solid.	Ratio of shell to solid.	Terminal Velocity.	Alt. due to terminal velocity.
inches.	inches.	lbs.	lbs.		feet.	feet.
4.6	4.53	9	$12\frac{3}{4}$	1.42	318	1580
5.8	5.72	18	$25\frac{1}{2}$	1.42	356	1980
8	7.90	47	67	1.42	420	2756
10	9.84	$91\frac{1}{2}$	130	1.42	468	3422
13	12.80	201	286	1.42	534	4430

Column 3, shows the weight of the shell filled with powder. Column 4, that of solid iron balls of the same size; and the ratio of these weights is given in the 5th column. Shells, being lighter than equal solid iron balls in the ratio of 1 to 1.42, have, in that proportion, less power to oppose resistance; and the greatest, or terminal velocity as given in the 6th column, will be less in proportion. The seventh column shows the heights due to these velocities in vacuo. From this table, and table IV, the greatest range, and corresponding angle of elevation of mortars may be determined.

Page 139) " Thus, to find the greatest range and corresponding angle of elevation for a 13 inch shell, discharged with a velocity of 2000 feet in a second; 2000, the initial velocity, divided by 534, the terminal veloci-

ty; taken from Table VI. gives 3.74; opposite to which in table V the angle 35° will be found to correspond. Then the number 2.8515 (corresponding in proportion,) obtained from the third column of table V, multiplied by 4.430 the altitude due to the terminal velocity of the shell, (column 7, table VI) gives 12632 feet, (about $2\frac{1}{2}$ miles) for the greatest range."

"Thus it appears, that even with the largest shells, particularly when the charges are great, there is a very considerable deviation from the parabolic theory, according to which 45° of elevation should give the greatest range. With sea mortars, when small charges are used, the cases for practice may be solved according to the deductions in article 9; but with the full charges, these will lead to error. The elevation required to produce the greatest range of a 13 inch shell, discharged with a velocity of 1500 feet per second, is $37^{\circ} 37'$."

"With a 10-inch mortar, the elevation corresponding to the greatest range of a shell projected with the above velocity, is about $36\frac{1}{2}^{\circ}$."

(Page 177.) "From this it follows, that instead of fixing all mortars in their beds at 45° elevation, the angle should be that which, with the full charge, gives the greatest range. Power of range, from mortar vessels particularly, is a very great consideration, because they cannot always choose their distance; and this power is unnecessarily restricted, and consequently, means wasted, by assuming the greatest range to be always due to an elevation of 45° ."

This excellent observation could be more extensively applied in this service, (Bengal Artillery) from the circumstance of our

mortars being provided with elevating screws. Tables from Sir Howard's rules, could be easily calculated, shewing the elevation giving the greatest range with all natures of mortars at different distances.

By firing the mortars at those angles of elevation, instead of invariably at 45° , a considerable saving of powder would accrue, and the extreme range be extended as remarked by the author.

(Page 196.) "The only infallible test of the goodness of gunpowder is, unquestionably, experiment: but there are certain properties by which an estimate of its quality may be formed. Good gunpowder should be of an uniform colour, approaching to that of a slate. The particles should be perfectly granulated, and free from cohesion. It should admit of being readily poured from one vessel into another; otherwise it may be concluded, either that the powder has been imperfectly glazed, or that it is damp. Good powder should be devoid of smell. If it have a disagreeable odour, it may arise from a practice which, I have been informed, is not uncommon, viz. heating the nitre excessively, for the purpose of drying it the more effectually. By this process a portion of the nitre may be de-composed; if so, potash, instead of nitrate of potash, will form a part of the power. Now this admixture would produce several bad effects. It would diminish the proportion of nitre: it might occasion the formation of sulphuret of potash, which would be indicated by the offensive smell of sulphureted hydrogen."

"In this case, the powder would easily become damp; for potash is a very deliquescent substance. To determine whether this be the case or not, dissolve some of the powder in pure or rain water, and add a solution of silver to that of the powder. If a black precipitate be formed, it may be concluded that sulphuret of potash existed in powder."

"It is possible, however, that the nitre may have been partly decomposed by having been over-heated, and, consequently that the powder will be liable to become damp, from the deliquescent nature of the potash, although no sulphuret of potash may have been formed. In this case, the clear solution of gunpowder will turn vegetable colours brown, or the juice of violets, or infusion of red cabbage, to a green."

"Powder will very readily attract moisture from the air, if manufactured with nitre containnig deliquescent salts, such as common salt; if this be the case, a solution of silver, added to one of the powder, in pure water, will give a white curdly precipitate. If an impurity of this nature be found to exist; or if powder, though originally composed of well purified ingredients, should once become so damp, from the influence of sea water, as to increase its weight beyond the quantity allowed in the proof, no dependance can be placed on the quality of the powder; for sea water contains so large a quantity of deliquescent salt, that as in the preceding case, although the powder may frequently be dried, and some times appear, not to be damp, yet it will re-attract moisture from a moist atmosphere, as often as exposed to it."

"Dampness in powder of good manufacture does not, in general arise, as is commonly supposed, from the nitre attracting moisture. Pure nitre is not in the slightest degree deliquescent, it is not even hygrometrical; whereas charcoal, particularly when newly made, imbibes aqueous vapour with such avidity, that a piece of perfectly dry charcoal, exposed to the action of the air for a week, will increase in weight about 14 or 15 per cent. and the matter absorbed consists principally of aqueous vapour."

"Thus powder of the best quality is liable to become damp, from a circumstance which cannot be prevented by any degree of care in preparing the ingredients, and which can only be avoided by effectually excluding the atmospheric air.

(Page 200) "In drying gunpowder that may have become damp, great care should be taken to regulate properly the degree of heat applied to the process: for there are several temperatures, considerably less than that required to explode the mixture, which are nevertheless capable of injuring it extremely."

"If the heat to which it is exposed be above 140 degrees of Fahrenheit the sulphur will begin to rise in vapour. At about 240 of Fahrenheit, the sulphur will melt, without igniting the nitre—the uniformity of the granulation will then be destroyed, and a number of small knotty lumps will be formed. These effects upon the sulphur may easily be shown, by scattering a few grains of gunpowder upon a plate of metal, heated unequally. The grains that fall upon parts much heated, will instantly explode: in other parts the small, blue, lambent flame of the sulphur will be seen to rise and subside,

without exploding the mixture. A still less degree of heat will cause the sulphur to melt; and a certain inferior degree of temperature will cause it to volatilize. The degree of heat therefore, used in stoves for drying gunpowder, should not be above 140° of Fahrenheit. When gun powder has become utterly unfit for service, the nitre may be separated by putting it into vessels containing water, by which the nitre will be readily dissolved, and may then be crystallized by evaporation."

"The improvement in the strength of gunpowder, is principally owing to the process of charring wood for the manufacture of it in iron cylinders: hence, the term *cylinder powder*. The wood, properly seasoned and prepared, is put into cast-iron cylinders, placed horizontally over stoves, and the front openings closely stopped. Heat is then applied; when the pyrolignous acid and a large portion of carbonated hydrogen gas come over, through tubes inserted in the back parts of the vessels; the gas is suffered to escape; the acid liquor is collected in casks; and the carbon left pure in the iron retorts."

The heat in the drying process in this country, must be nearly 140° if not more at times.

Proofs of Gunpowder.

"(Page. 202.) Lay a drachm or two of powder on a piece of clean writing paper, and fire the heap by means of a red-hot iron wire: if the flame ascend quickly, with a good report, leaving the paper free from white specks, and do not burn it into holes, the goodness of the ingredients, and proper manufacture of the powder may be safely inferred."

"When good gunpowder is blasted upon a clean plate of copper, no tracks of foulness should be left."

“Gunpowder exposed for seventeen or eighteen days to the influence of the atmosphere, should not increase materially in weight. One hundred pounds of powder should not absorb more than 12 oz. If it increase in weight more than 1 per cent. it is a proof that deliquescent salts abound in a degree which should warrant the condemnation of the powder.”

This proof must be uncertain, depending on the state of the atmosphere.

“(Page 224.) In the Shannon, San Domingo, &c. moveable sights of different heights were fixed upon the second reinforce ring; one adjusted for point blank direction, the others for different elevations, as far as line-of-metal. The only fixture upon the breech was a confining sight, to warn the Captain of the gun to keep his eye down to the level of the notch in the base-ring, in line with the other sight.”

(Page. 233.) *Tubes and Priming.*—“Much has been attempted on this subject; but after as many trials as ever have been made upon this important matter, I am convinced, that a priming of pure powder is infinitely preferable to any mode of conveying ignition to the tube by quick-match, or by a double tube, or by any other squib-like medium.”

(Page 289.) *Extract of a letter from Sir A. Dickson. K. C. B. &c. Royal Horse Artillery.*

Valenciennes, 20th April 1818.

“The use of the double flinted lock with heavy ordnance, particularly in the operations of a siege, presents very great advantages; for by the employment of a slow-match only, the fire is frequently retarded and

nothing can be more dangerous than lighted portfires in a battery. I have seen several very shocking accidents occasioned by the use of them, owing to the want of presence of mind of the gunner having the portfire lighted in his hand at the moment of a shell falling near him. In the sieges I have directed, I have ever prevented, as much as in my power, the use of portfires: but Ciudad Rodrigo was the only operation in which I was fully successful in this respect; and it was to the help of about 16 or 20 naval gun-locks, in addition to the slow-match used, that I was indebted for the vigorous fire kept up in that attack."

"Your observation with respect to fixing fresh flints, in some degree refers to us, as well as to the navy; for I have observed many gunners, when their flint was worn out, have immediate recourse to the portfire or slow-match, never thinking of fixing a new flint, unless obliged so to do, until a pause in the fire gave deliberate time for the operation. Now although no defence can be offered, for what evidently arises from want of coolness, still in many situations it may be an object, that the rapidity of the fire should not be interrupted by even so short an operation as changing a flint, the general advantage of the use of locks being therefore admitted, *that* to be derived from your double lock becomes the more evident. I trust in future, therefore, that in all siege equipments, each piece of ordnance will be supplied with a lock, the use of which, under every circumstance except in heavy rain, would supersede the portfire, which in the very confined situation of a land battery, and where much powder is in circulation, is so dangerous."

“On most occasions of this nature, I have, in a considerable proportion, been reluctantly obliged to permit the use of portfires, in consequence of the deficiency of locks, and the delay occasioned by the employment of the slow-match.”

“In the operation of defence also, the same arguments, in a great degree, hold good in favour of locks; and they are truly valuable in coast batteries, and in all night firing.”

(Page 304.)“ N. B. Since the M. S. of this Work was sent to the press, some experiments have been tried with oblong-shells, upon the principle of Shrapnel's shells. Several natures of oblong-shells, more or less cylindrical, with flattened ends, and with hemispherical ends, were tried.”

“Those which had the cylindrical part equal to one third of the diameter, and the ends half spheres, ranged steadily and succeeded perfectly; from which we may infer, that the oblong-shot mentioned in (Arts 39 and 40,) might be used with great effect in the manner therein recommended.”

From experiments made here with shells and shot of this description, but with flattened ends, I should judge them not to whirl during the first part of their flight.

MISCELLANIES.

Cassini's Map of France; from the Monthly Magazine 1814.

The science of Geography has always been pursued by the French, for Military purposes, with far more zeal than by the English; of this we have an evidence in the incomparable Map of France by the family of Cassini, which, though the most famous and valuable in all the world, is but partially known in England. It was begun in the year 1683, by John Dominic Cassini, and prosecuted with unabating vigour by him and his sons for the space of 113 years; at the termination of which period, in the year 1796, it was brought to a happy conclusion, and is now presented as an admirable specimen of human industry and ingenuity. It consists of 183 leaves, comprehending altogether a space of 785 square feet, each leaf having 2 feet $8\frac{2}{5}$ inches in width, and 1 foot $7\frac{2}{5}$ inches in height. The measure for the geographical mile is 3 inches and 2 lines; a scale which sufficiently bespeaks the ampleness of the detail which it affords. Among the numberless objects presented upon it, are the plans of towns, fortresses, and even villages, with all their roads and environs; the situation of little chapels, crosses, windmills, and other places which have been distinguished by battles; the course of rivers, canals, brooks, high roads, lanes, bye-ways; with a notice of all the post stations, toll-houses and the like; also a particular notification of the ponds, marshes, hills, rocks, downs, vallies, forests, bushes, heaths, tilled lands, gardens, boundaries of districts, and in

short, every thing which can possibly be of any service in a campaign. It was at first conducted under the patronage of the Royal Family of France; but in the year 1756 they were compelled to withdraw there support, and the concern was carried on by a Society until its completion, when the revolutionary government siezed it, and converted it into national property. After many remonstances on the part of the proprietors against this infraction of their private rights, the government consented to indemnify them by the payment of 453,000 livres, which was little more than half what had been expended upon its completion. After the exact model of this Map, a second was executed for the Austrian Netherlands, by Count Von Ferraris, in 1777, at the command of his Imperial Majesty the Emperor of Austria; and these two have since been imitated by different continental geographers, by whose assistance the French acquired such a perfect familiarity with the topography of every country, as gave them a decided advantage in all their campaigns.

Late Major Roughsedge.

Died at Soanpore, sixty miles south of Sumbhulpore, on the 13th of January, of a fever which had harassed him above 3 months, Major Edward Roughsedge of the 26th Regt. N. I. late commanding the Ramghur Battalion, and Agent to the Governor General. Few men will be more generally or more justly regreted than this distinguished officer, of whom it may be said with entire justice, that he was an ornament alike of the service to which he belonged, and of private society. In public life, his undeviating rectitude of conduct, secured to him

the approbation of Government, and the confidence and love of all in any way placed under his controul. Raised when a very young man to the command of an important corps, and placed in a very responsible and confidential situation, frequently calling for the exercise of extensive civil, as well as Military powers; he invariably conducted himself with wisdom, probity, and humanity. In a long course of years, and amidst various clashing interests and open and concealed enmities, he managed the affairs of the numerous small principalities on the South West Frontier, with approved integrity and judgment: and in the settlement of all their disputes, whether arising amongst themselves or with the Government, evinced a sound discretion, great personal purity, and the most even handed justice. His affability with the natives,—both high and low his thorough knowledge of their customs and language, his undeviating kindness of feeling and attention to their prejudices, wishes, and interests, had gained him such an ascendancy over them, that his name was a pass-word for every thing just and honorable; and his order ranged undisputed over a tract of country extending several hundred miles and comprising many different tribes and classes of men. In 1813, when our provinces were threatened with an invasion by the Pindarees, he was entrusted with the important post of defending the frontier between the Soane and Cuttack; and about three years ago the unlimited confidence which Government had long reposed in him was crowned, and the importance of his situation enhanced, by his nomination as Political Agent; an appointment, the duties of which he had in fact long virtually exercised. As a soldier,

Major Roughsedge had frequent opportunities of shewing that he combined all the principal virtues of Military life: daring courage, intrepidity, utter carelessness of self, kind consideration for his officers and men, protection of his friends, and clemency to his enemies. He successively subdued various refractory chiefs without cruelty or oppression, and on every occasion shewed the utmost desire to avoid hostilities, and spare blood.

In private life, Major Roughsedge was not less estimable. His unsparing hospitality has been experienced at one time or other, by half of his brother officers, and was indeed proverbial throughout India. To the officers of his Corps he so endeared himself, that he was held by them in the light of an elder brother, rather than of a master or superior. He possessed great sweetness of disposition and amiability of temper; so that those who lived with him for years, never saw him angry or even ruffled,—such was his amenity. His benevolence and munificence might be termed princely; and yet so little conscious was he of their value, that he felt surprise, and even displeasure, if any covert acts of his kindness were accidentally mentioned before him. In conversation he was unassuming, amusing, and instructive. He had carefully cultivated a naturally very superior understanding by extensive reading, and was full of information on almost every subject. In argument he was clear, acute, and convincing; and his repartees were lively and pointed, without being personal or ill-natured. So much indeed of the true milk of human kindness was mixed up with his nature, that the writer of these hasty lines, who had the happiness of knowing him well, firmly believes he scarce ever remembered an injury, a

few days after it had been committed, and never cherished enmity against a living being. That such a man should be untimely cut off from his family, friends, and country, whilst in possession of station, fortune, high reputation—all that renders life valuable—is most afflicting: and to his friends, would be scarcely endurable, if the sad uncertainty of human prospects and enjoyments did not daily teach them the better lesson of resignation.—*Government Gazette.*

Drag-chains instead of Drag-ropes.

Lieutenant Timbrel of the Bengal Artillery, has lately proposed the introduction of *Drag-chains* instead of *Drag-ropes*; and having proved the superiority of the former, they will, we believe, be universally adopted in this service.

The old *Drag-ropes* were cumbersome, unwieldy things, and difficult to be packed neatly and securely on a gun. The Chain which Lieutenant Timbrel proposes, hooks upon the breast transom, and folds (by means of rings) on a hook, so as to require no further securing when not in use; it is always in its place, and easily spread out at length by the first man who is at his post, when the gun is required to be moved by manual labor.

The durability of the *Drag-chain* is also greatly in its favour.

Standard Gauge for an 8-inch Mortar for proving Gunpowder.

Lieutenant Oliphant of the Bengal Artillery, has formed a standard Gauge for the 8-inch mortar, for prov-

ing gunpowder, which would probably be of important service in establishing uniform ranges, with equal powder, provided the mortar was always rejected, if not exactly agreeing with the Gauge.*

The Gauge is formed by two brass crosses, having the ends tipped with steel.

The crosses are separated from each other by a steel spindle, of about $2\frac{1}{2}$ or 3 inches long, so that when inserted into the mortar, the spindle will be in the axis of the bore, and the crosses which shew the diameter will be sure of being in perpendicular planes to that axis.

There is no kind of adjustment to the Instrument, as this is not necessary for the purpose to which the Gauge is to be applied, and it would probably lead to error if so constructed. An adjustment might however, easily be made by 4 indexes, sliding in grooves along each arm of the cross, so as to indicate what excess of diameter there is in a mortar, in case there should be any ; but this may also be obtained with the present Gauge, by inserting any small thin body between one of the ends of the cross and the side of the bore. In case of such excess, however, the mortar should be rejected, and the Instrument might be sent down to the arsenal to Gauge another, to supply the place of the former one.

*Of course supposing the shells are of the true weight, and diameters exactly.



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